Winter 2017

Environmental impact assessment of: Sunset Fish Passage and Energy Project

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Prepared for ESCI 493; Winter 2017
Huxley College of the Environment – Western Washington University

The Sunset Fish Passage and Energy Project EIA Team
Environmental Impact Assessment – ESCI 493
Huxley College of the Environment
Western Washington University
516 High St
Bellingham, WA 98225

March 9th, 2017

Dear Concerned Citizen,

The Sunset Fish Passage and Energy Project Environmental Impact Assessment is enclosed for your review. This Project was proposed by the Snohomish County Public Utility District, and the lead agency is the Federal Environmental Regulatory Commission (FERC). In it you will find an analysis of a proposed hydroelectric project on the South Fork of the Skykomish River in Snohomish County, Washington.

An alternative project was considered as well. The Wild Horse Wind Power Project, a wind turbine construction project in Kittitas County, is the proposed alternative Project. The proposal includes adding 18 new wind turbines to the existing 149 turbines.

Our team analyzed the impacts on the natural and built environment for both the proposed and alternative Projects and in this document we discuss each element in detail. We also consider a No-Action alternative in which neither project takes place. Mitigation measures are provided for significantly impacted elements.

This Projects aim to fulfill growing demand for electricity in Snohomish County while creating as little environmental disturbance as possible. Both Projects would prevent the addition of pollution that comes with energy production through the burning of fossil fuels.

Thank you for your interest in the Project.

Sincerely,

Emily Swortz, Caitlyn Jobanek, Miles Mayer, Isaiah Wynter, Evan Oster

Environmental Impact Assessment
Huxley College of the Environment

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Signature _____ (Isaiah Wynter)

Date 3-9-2017

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Prepared for ESCI 493; Winter 2017
Conducted Under the Supervision of Dr. Leo Bodensteiner
Huxley College of the Environment – Western Washington University

This report represents a class project that was carried out by students of Western Washington University, Huxley College of the Environment. It has not been undertaken at the request of any persons representing local governments or private individuals, nor does it necessarily represent the opinion or position of individuals from government or the private sector.

Fact Sheet

Project Title:

The Sunset Fish Passage and Energy Project

Description of Project:

The Sunset Fish Passage and Energy Project proposes to build a small hydro facility with a total nameplate capacity 30-megwatt (MW). This Project will help to accommodate expect increases in energy demand from Snohomish County and Camano Island. The small scale hydro project is proposed to be installed on the South Fork of the Skykomish River between river mile 52.7 and 51.6, approximately one-mile south of Index, WA. This section of the river is marked by a unique geomorphologic feature. The river turns almost 180 degrees, which results in the formation of a large natural pool. The pool would be used as a reservoir. Water would be diverted from the pool to a powerhouse located underneath the existing Washington Department of Fish and Wildlife (WDFW) Fish Trap and Haul facility. The hydro project would require the construction of a submerged surface intake structure with gate, trash rack, fish screens, and downstream fish passage. An underground tunnel for water diversion would be required. The tunnel would be 1,400 feet long with a diameter of 22 feet and would be unlined (District. 2016b). A powerhouse would be constructed, housing two twin 15.0 MW turbines (District. 2016b). The power house would be semi-buried and located under the existing Trap-and-Haul facility. A transmission line would be constructed in an existing distribution corridor. The 115kV transmission line would be approximately 8.5 miles long (District. 2016a). In addition to constructing the small hydro project, the Snohomish PUD proposes to refurbish the WDFW Trap-and-Haul facility to improve fish transportation to 90 miles of upstream spawning habitat.

Legal Description of Location:

South Fork of Skykomish River at river mile (RM) 51.5, one-mile south of Index, WA in Snohomish County.

Proposer:

Public Utility District No. 1 of Snohomish County
2320 California Street
P.O. Box 1107
Everett, WA 98206-1107

Tel: (425) 783-1000

Lead Agency:

Federal Energy Regulatory Commission (FERC)
888 First Street, NE
Washington, DC 20426

Tel: (202) 502-8659

Permits:

- Hydraulic Project Approval – WDFW
- Section 401 Water Quality Certification and NPDES Construction Stormwater permits – Ecology
- Section 404 Permit – U.S. Army Corps of Engineers
- Forest Practices Permit – Washington State Department of Natural Resources (WDNR)
- Shoreline Substantial Development Permit, Conditional Use Permit, Building Permit(s) and Clearing and Grading Permits – Snohomish County
- Non-consumptive water permit for 2,500 cfs (water permit number S1-28734)

Contributions by Each Author:

Emily Swortz: Air, Public Services & Utilities, Environment, Initial Format Setup and Styling, Fact Sheet, Glossary and Abbreviations

Caitlyn Jobanek: Plants and Animals, Formatting, Editing, List of Tables, List of Figures

Miles Mayer: Earth, Executive Summary, Conclusion, Glossary and Abbreviations, Formatting, Editing, Alternative Action, Fact Sheet: Project Description

Evan Oster: Water, Land and Shoreline Use, Energy and Natural Resources, Formatting and Citations

Isaiah Wynter: Environmental Health, Transportation

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Digital Collection, Huxley Map Library

Acknowledgments:

Patrick Kennedy, Bellingham REI Contact
Dawn Presler, Snohomish Public Utilities Department

Issue Date:

March 9, 2017

Public Presentation Date and Time:

Thursday March 9th, 2017 at 6:00 p.m. at REI

Address: Bellingham REI
Sehome Village
400 36th St
Bellingham, WA 98225

Executive Summary

Background Information:

The Snohomish County Public Utility District (PUD) No. 1 filled for a preliminary permit with the United States of America Federal Energy Regulatory Commission (FERC) to study the feasibility of a hydroelectric project on the South Fork of the Skykomish River on September 28th, 2011. This small scale hydroelectric project is referred to as the Sunset Fish Passage and Energy Project. By 2015 the FERC had approved the preliminary permit, as well as granted a two-year extension to the Snohomish PUD to continue investigations. In addition to the proposed hydro project, this document suggests an expansion of a pre-existing wind energy facility, called Wild Horse Wind and Solar Facility, as an alternative to subsidize the energy output from the hydro facility. The following Environmental Impact Assessment (EIA) discusses the probable environmental impacts that would result from the hydroelectric project, alternative wind energy project, and no action alternative.

Project Need:

The Snohomish PUD, or District, is the second largest publicly owned utility in Washington (District. 2016c). The District services over 2,200 square miles, including all of Snohomish County and Camano Island (District. 2016c). The Snohomish PUD's service area is expected to reach almost 1 million residents in the next 15 years (District. 2016c). This corresponds to an energy load growth of 25% (District. 2016c).

In March of 2007, the District approved a Climate Change policy (District. 2016c). The policy encourages the PUD to meet future growth energy demands through cost-effective conservation programs and a diverse mix of renewable energy resources. Several criteria were established for small scale hydro projects that would satisfy the Climate Change policy (District. 2016a). The hydro project must be upstream of, or at a natural barrier to anadromous fish (District. 2016a). The hydro project must be outside of old-growth forest lands, Federal Wilderness areas, and Federal Wild and Scenic River designations (District. 2016a). If any prior Environmental Impact Statements (EIS) were completed, there must have been no major environmental issues found (District. 2016a). Additionally, the hydro project must be located in a region with no known major geological hazards or unstable areas that would prevent construction (District. 2016a). Last, the hydro project must be located in close proximity to existing electrical transmission systems (District. 2016a). This would reduce vegetation clearing for a distribution corridor, minimize construction costs, and minimize need for new road construction (District. 2016a).

The PUD investigated the potential for a hydroelectric project on the South Fork of the Skykomish River in the early 1980s (District. 2016a). Additionally, two private power developers and the City of Tacoma investigated this area for hydropower in the 1990s (District. 2016a). No major environmental issues were found during these investigations but the companies did not pursue the project. In 2009 and 2010, the Snohomish PUD investigated 140 potential small scale hydro projects within Whatcom, Skagit, Snohomish and King counties (District. 2016a). Of the 140, Sunset Fish Passage and Energy Project was the most favorable in terms of resource to cost ratio. The Project could help account for expected energy increases within the District's service region, as well as provide a local renewable energy source.

Project Description:

The proposed location for the Sunset Fish Passage and Energy Project is near Sunset Falls on the south fork of the Skykomish River approximately 38 miles east of Everett and one-mile south of Index, WA. The Project area is on land that is not owned by the Federal Government, nor is the land tribal reservation land. A variety of entities own the land on which the Project is proposed to be constructed. These entities include the Washington State Department of Fish and Wildlife, the Washington State Department of Transportation, the Burlington Northern Santa Fe Railway Company, and private individuals. The proposed project would operate similar to a run-of-the-river dam. However, there is no river impoundment. Instead, a unique geomorphologic characteristic of the south fork Skykomish River creates a large natural pool that will act as a reservoir. At the proposed site the South Fork of the Skykomish River turns almost 180 degrees. The abrupt turn in the river creates a back welling of water that has resulted in a large natural pool. The proposed hydroelectric Project would draw water from the pool through a submerged surface intake structure. The water taken from the pool would flow through an underground tunnel to a powerhouse facility located at the base of Sunset Falls. The powerhouse will be located underground at the site where an existing Trap-and-Haul fish facility is located. The Trap-and-Haul facility is owned and operated by Washington State Department of Fish and Wildlife. The facility is used to transport salmonids upstream of the impassable Sunset Falls. Upstream of Sunset Falls there is pristine spawning habitat. The Trap-and-Haul facility is used to transport salmonids to this spawning habitat. Water will continue to flow through the 1.1-mile bypass reach of the river to accommodate fish habitat needs and aesthetic values of the falls.

The hydroelectric Project has an estimated maximum capacity of 30.0 megawatts (MW). It will generate approximately 119.38 gigawatt hours annually (District. 2016a). The PUD suggests that the Project can provide energy sufficient to power 22,500 homes when operating at full capacity. The area of permanent impact is less than five acres (District. 2016a). The proposed location for the Project is located close to Highway 2, a major transportation route with access roads and an electric transmission distribution corridor. This reduces the need for extensive additional clearing to construct and operate the facility. Additionally, the District has proposed to provide improvements to the Trap-and-Haul Facility as a mitigation control for the construction of the project. The proposed upgrades to the Trap-and-Haul Facility would improve collection, storage, and transport of all salmonids, including the Federally listed salmon and steelhead, to 90 miles of upstream spawning habitat (District. 2016a).

Alternative Project Description:

Wild Horse Wind and Solar Facility is owned by Puget Sound Energy (PSE) (Wild Horse Wind and Solar Facility. 2017). The facility is located approximately 16 miles east of Ellensburg, WA in Kittitas County (Wild Horse Wind and Solar Facility. 2017). This facility has 149 wind turbines spanning across 10,000 acres (Wild Horse Wind and Solar Facility. 2017). The facility is located at an elevation of around 3,500 feet near Whiskey Dick Mountain (Wild Horse Wind and Solar Facility. 2017). When operating at nameplate capacity, the facility can generate up to 273 MW of electricity, which is enough to service 63,000 homes (Wild Horse Wind and Solar Facility. 2017). As an alternative to the Sunset Fish Passage and Energy project, an expansion of 18 V80-1.8 MW Vestas wind turbines could subsidize the energy requirements for Snohomish County. These wind turbines operate at maximum capacity in winds of 31 mph

(Wild Horse Wind and Solar Facility. 2017). The minimum wind requirement for turbines is 9 mph. At wind speeds of 56 mph the turbines will shut down (Wild Horse Wind and Solar Facility. 2017). The average wind speeds at Wild Horse Wind and Solar Facility is 17 mph (Wild Horse Wind and Solar Facility. 2017). PSE sells excess energy generated by wind facility to other entities (Wild Horse Wind and Solar Facility. 2017). The Snohomish PUD could implement the expansion of this facility and then buy green energy from PSE.

No Action Alternative:

The no action alternative consist of not building the hydro facility on the Skokomish River nor implementing the expansion of Wild Horse Wind and Solar Facility. A no action alternative would result in no environmental impacts, but would also fail to address the expected increases in energy demands for the Snohomish PUD.

Recommended Action:

Upon evaluating the significant adverse environmental impacts for the Proposed Action, the Alternative Action, and the No Action Scenario, the contributors to this Environmental Impact Assessment (EIA) propose the Snohomish PUD be granted the appropriate licenses to implement the Sunset Fish Passage and Energy Project. With the proposed mitigation measures the adverse environmental impacts would mainly be temporary and occur during the five-year construction period. The permeant adverse environmental impacts would be sufficiently off-set by the upgrades to the Trap-and-Haul Fish Facility. Upgrades to the Trap-and-Haul Fish Facility would improve fish populations in the area. In addition to the current mitigation measures proposed by the PUD, it is suggested that a minimum of 400 cfs, instead of the proposed 250 cfs, be measured at the compliance gauge. This additional mitigation measure will ensure safe migration of salmonids downstream over Sunset Falls as well as ensure sufficient flows over the falls for aesthetic and recreational values. The proposed Alternative Action would likely lead to more expensive energy costs for citizens in the service area. Additionally, the PUD would not own the energy and would be subject to volatile short term energy markets. According to the Decision Matrix, the Alternative Action resulted in more adverse environmental impacts. The No Action Alternative does result in no degradation to the environment. However, the No Action Alternative also fails to address the energy needs for the Snohomish PUD and therefore is not a viable option. The Sunset Fish Passage and Energy Project is the recommended action as a viable, environmentally safe method to produce renewable energy for the people of Snohomish County and Camano Island at a favorable cost.

Table of Contents

List of Figures

List of Tables

Glossary

Anadromous- Fish that are born in freshwater, migrate to saltwater, mature and return to freshwater for spawning.

Bedrock- The solid mass of rock that underlies loose deposits of soils and gravels

Distribution Corridor- A distribution corridor is a cleared area in which transmission lines can be built in. Distribution corridors are cleared of large vegetation and usually have road access.

Excavation- Removal earth material carefully and systematically from an area.

Liquefaction- Loose sand and silt that is saturated with water can behave like a liquid when shaken by an earthquake.

Nameplate Capacity/ Installed Capacity – The nameplate or installed capacity is the maximum full-load sustained output that can be derived from an energy facility.

Penstock- A channel, trough, or tube for conveying water from a lake, dam, etc., especially to a waterwheel or turbine (oxford English dictionary online)

Powerhouse- A building in which power is produced on a large scale for driving machinery or for generating electricity for distribution; a power station, a power plant.

Riparian- relating to or situated on the banks of a river

Salmonids- Salmonids are a family of ray-finned fish. Salmonids include salmon, trout, chars, whitefishes, and graylings.

Slope Failure- a phenomenon by which a slope of land collapses abruptly due to weakened self-retainability of the earth under the influence of rainfall or an earthquake.

Small-Scale Hydro- The Department of Ecology defines small hydropower as facilities that have a capacity of 30 megawatts or less.

Transmission Line- A transmission line consists of a pair of electrical conductors carrying an electrical signal from one place to another.

Trap and Haul Facility- A trap and haul facility can be used in places where it is not practical to install a fish ladder. Trap and haul facilities operate by forcing migrating fish into holding tanks where they are then loaded onto specialized tankers or trucks. The vehicles transport the fish upstream of the barrier and release them.

Weir- A barrier or dam to restrain water, especially one placed across a river or canal in order to raise or divert the water for driving a mill-wheel; also, the body of water retained by this means. (Oxford English Dictionary Online)

Acronyms and Abbreviations

BNSF…….. Burlington Northern and Santa Fe Railway

Cfs…… Cubic Feet per Second

EIA…… Environmental Impact Assessment

EIS…… Environmental Impact Statement

EPA……..Environmental Protection Agency

FERC…… United States Federal Energy and Regulatory Commission

kWh…….. Kilo watt hours

Mph …….. Miles per Hour

MW……. Mega Watt

PUD……. Public Utility District

NRHP …… National Registry of Historic Places

NRI ……..Nationwide Rivers Inventory

RCW…….. Revised Code of Washington

SEPA……. State Environmental Policy Act

TRMP …….Terrestrial Resources Management Plan

USFS…….. United States Forest Service

WDFW…… Washington State Department of Fish and Wildlife

WHWPP…… Wild Horse Wind Power Project

WSRA…… Washington State's Wild and Scenic River Act

Decision Matrix

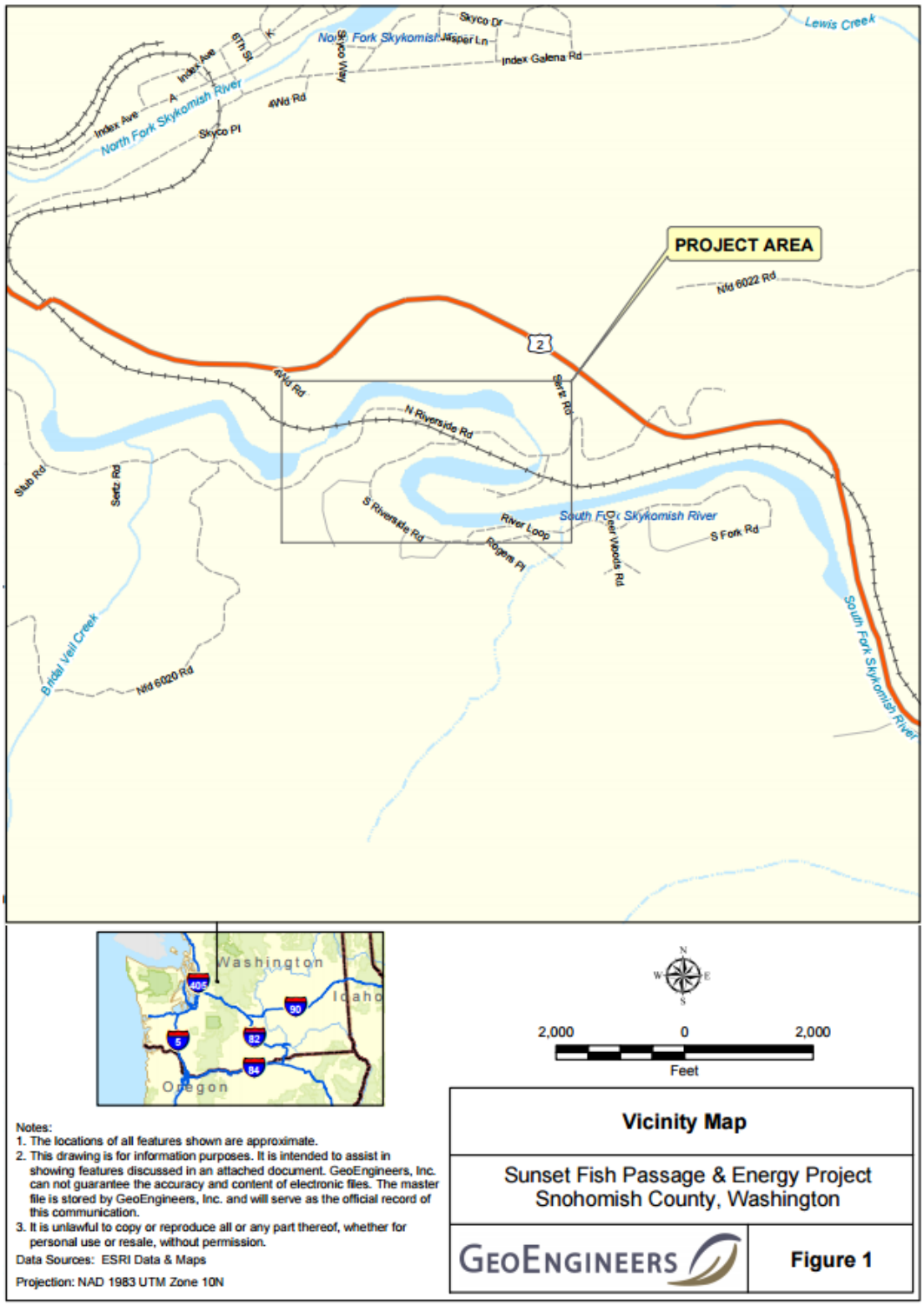
Strong Positive Impact	++, valued at +2
Moderate Positive Impact	+, valued at +1
No Impact or Neutral	0, valued at 0
Moderate Negative Impact	-, valued at -1
Strong Negative Impact	-- , valued at -2

	Proposed Action	Alternative Action	No Action
Earth			
Geology	0	0	0
Soils	-	-	0
Topography	0	0	0
Erosion	+	-	0
Air			
Air Quality	0	0	0
Odor	0	0	0
Climate	+	+	0
Water			
Surface Water	-	0	0
Run-off	-	-	0
Flood Risk	0	0	0
Ground Water	-	-	0
Public Water Supply	0	0	0
Plants and Animals			
Habitat	-	-	0
Threatened/ Endangered Species	-	-	0
Fish and Wildlife Migration	+	-	-
Energy and Natural Resources			
Amount Required/ Rate of Use	+	+	0
Source/Availability	++	-	0
Nonrenewable Resources	0	0	0
Conservation and Renewable Resources	+	+	-
Scenic Resources	-	--	0
Environmental Health			
Noise	-	-	0
Risk of Explosion	0	0	0
Release/Potential Release of Hazardous Substances	-	-	0

Land & Shoreline Use			
Relationship to existing land use plans and populations	-	0	0
Housing	0	0	0
Light and Glare	-	-	0
Aesthetics	--	--	0
Recreation	-	-	0
Historic & Cultural Preservation	0	0	0
Agricultural Crops	0	0	0
Transportation			
Transportation Systems	-	-	0
Vehicular Traffic	-	-	0
Waterborne, Rail, & Air Traffic	0	0	0
Parking	0	-	0
Movement/Circulation of People or Goods	0	0	0
Traffic Hazards	-	-	0
Public Services and Utilities			
Fire	0	0	0
Police	0	0	0
Schools	0	0	0
Parks & Other Recreational Facilities	-	0	0
Maintenance	0	0	0
Communications	0	0	0
Water/Stormwater	0	0	0
Sewer/Solid Waste	0	0	0
TOTAL:	-11	-17	-2

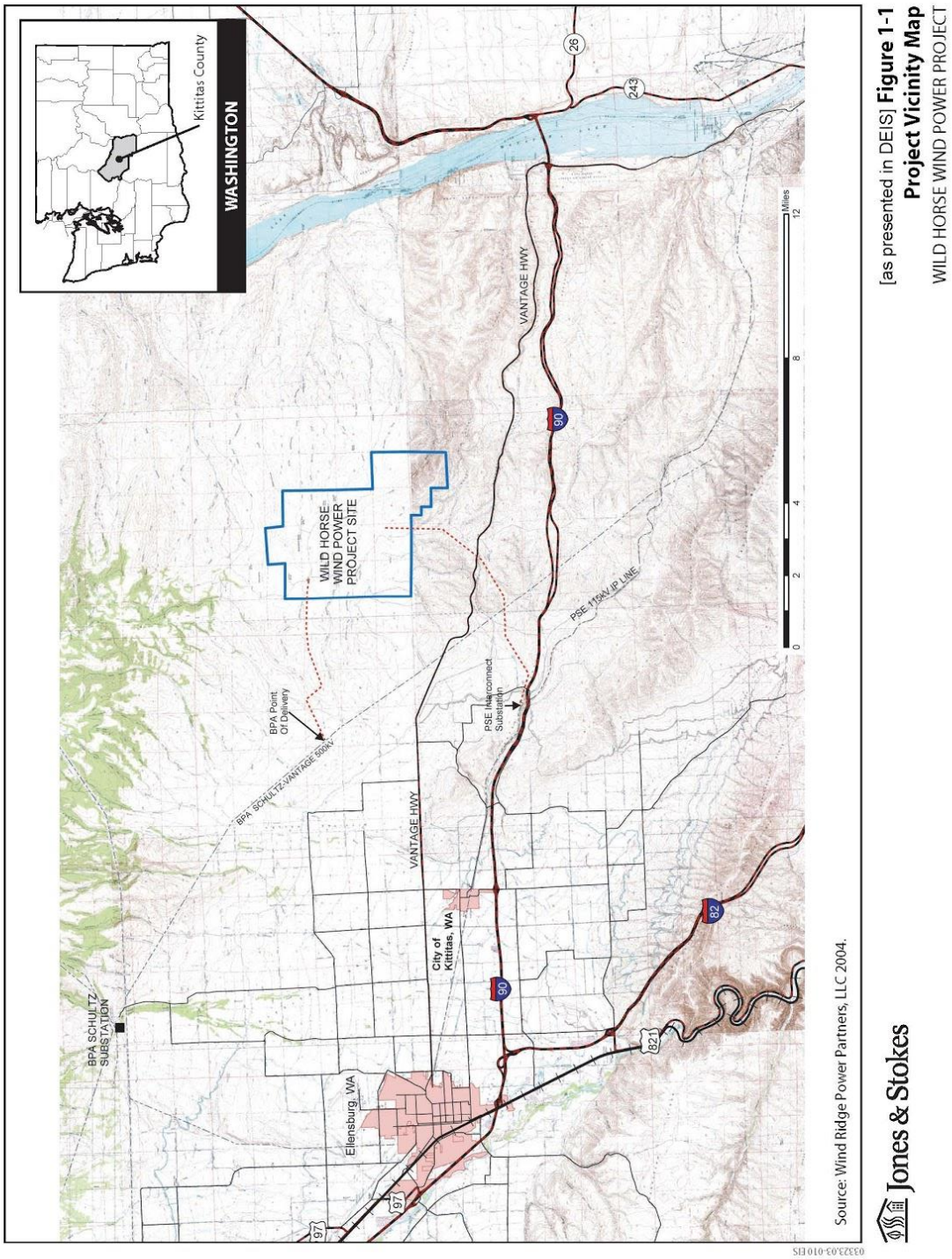
Reference Map

Proposed Action- Sunset Fish Passage and Energy Project



Reference Map

Alternative Action- Wild Horse Wind and Solar Facility



Elements of the Environment

Earth for Proposed Action

1. **Geology**
    a. *Existing Conditions*

The proposed location for the Project is entirely within the Index Batholith (District. 2014a. Geotechnical). A batholith is a large amount of molten rock that rises from beneath the Earth's surface until temperatures are cool enough to solidify the molten rock. The Index Batholith consist of Tertiary-age granodiorite rock. The Index Batholith encompasses approximately 180 square miles of the Cascade Mountain range (District. 2014a. Geotechnical). Rock borings in drilled near the top of Sunset Falls showed the granodiorite rock to be fresh to moderately weathered (Report of Geotechnical Studies). Quartz, feldspar, hornblende and biotite are the dominant minerals within the granodiorite (Report of Geotechnical Studies). The granodiorite rock that underlies the Project area is hard and durable. The rock has an estimated strength range of about 10,000 to 32,000 pounds per square inch (District. 2014a. Geotechnical). The borings also indicated that the hydraulic conductivities of the rock range from $4.4*10^{-7}$cm/sec to a high of $3.7*10^{-4}$cm/sec (District. 2014a. Geotechnical).

Glacial deposits overlie granodiorite bedrock in some areas of the Project vicinity. Glacial deposits largely consist of glaciolacustrine silt and clay varves (Report of Geotechnical Studies). Glaciolacustrine deposits are sediments that were deposited into a glacial lake through glacial activity. These glaciolacustrine sediments are finely laminated with thin layers of sand and occasional drop stones (Report of Geotechnical Studies). Drop stones are glacial erratic's that have been buried in sediment. Slopes within the Project area that have overlying glaciolacustrine deposits are prone to landslides (District. 2014a. Geotechnical).

Modern stream alluvium also overlies granodiorite bedrock in several areas (Report of Geotechnical Studies). Alluvium deposits consists of sand gravel with cobbles and occasional boulders. The north side of the low peninsula has alluvial sediment overlying bedrock due to flooding during high flow events (River Hydraulic).

    b. *Impacts*
        i. *Impacts of Proposed Action*

Excavation of bedrock for construction of Project facilities will impact geology of the Project area. A total of 170,000 cubic yards of bedrock will need to be blasted and excavated. The estimated rock quantities and number of blasts can be found in Table 1. Project facilities will be mounted in granodiorite bedrock to avoid liquefaction and landslide risk (District. 2014a. Geotechnical). Massive granodiorite bedrock is exposed along the river near the powerhouse and Trap-and-haul facility (District. 2014a. Geotechnical). The site is covered with a layer of blasted rock and gravel fill, placed directly on top of the bedrock (District.

2014a. Geotechnical). This rock fill area at the powerhouse and trap-and-haul facility was graded during the 1957 construction of Sunset Falls Fishway to help fish collection and trucking operations (District. 2014a. Geotechnical).

ii. Impacts of No Action Alternative

There would be no environmental impacts to the geology of the area if the no action alternative was implemented.

c. Mitigation Measures

Bedrock exaction will be performed using blasting of bedrock and heavy machinery to transport blasted bedrock (District. 2014a. Geotechnical). The amount of rock excavated during any one blasting round will be limited to minimize fracture damage to bedrock (District. 2014a. Geotechnical).

Table 1: This table shows the estimated quantities of bedrock that will need to be blasted and the associated number of blasts. The table also shows the estimated time frame for blasting procedures.

Project Feature	Estimated Rock Quantities (CY) / No. of Blasts (N)			Estimated Durations
	Open	Shaft	Tunnel	
Intake	15,000/10			22 days
Headrace Tunnel			15,000/46	34 days
Fish Screen Facility	65,000/64			58 days
Powerhouse tunnel		5,000/9	30,000/103	94 days
Powerhouse	35,000/28			31 days
Tailrace Tunnel			5,000/8	8 days
Blasts Totals (N)	102	9	126	

2. Topography

a. Existing Conditions

At the proposed project location, the Skykomish River flows from east to west. However, just prior to Canyon Falls the river turns almost 180 degrees which results in the formation of two peninsulas near the Project area. The first peninsula, located north, is referred to as the High Peninsula (Report of Geotechnical Studies). The second peninsula, located south, is referred to as the Low Peninsula (Report of Geotechnical Studies). Figure 1 provides a reference map for clarity.

The Low Peninsula has a mix of residences, cabins, and vacant parcels that were platted in the 1950s (Report of Geotechnical Studies). Along the south side of the western edge of the peninsula there is a ridge that averages about 25 feet above river level (Report of Geotechnical Studies). The ridge slopes toward the river at a gradient greater than 70 percent along the south side of the ridge (Report of Geotechnical Studies). Along the north side of the ridge the gradient is more moderate between 40 to 60 percent (Report of Geotechnical Studies). The north side of the ridge descends to a low-lying flood plain that is vegetated with cottonwood, hemlock, and cedar trees (Report of Geotechnical Studies). The ridge

of the low peninsula is vegetated with scattered to dense growth of Douglas fir, cedar, hemlock, and a dense understory (Report of Geotechnical Studies).

The High Peninsula is the larger of the two peninsulas and is the proposed location for the water surface intake structure, underground power tunnel, and fish screen (Report of Geotechnical Studies). Along the south face of the High Peninsula slopes are moderate to steep, in some areas reaching gradients of 100 percent (Report of Geotechnical Studies). There is a ridge along the east side of the High Peninsula that consists of two knobs separated by a saddle about 10 feet below the elevation of the knobs (Report of Geotechnical Studies). The ridge crest consists of bowl-shaped topography along the northwest side with slopes ranging from 20 to 40 percent (Report of Geotechnical Studies). There is a steep bluff along the north side of the High Peninsula (Report of Geotechnical Studies). The High Peninsula is vegetated with mature cedar, hemlock, and Douglas fir trees (Report of Geotechnical Studies).

b. Impacts

i. Impacts of Proposed Action

There are no significant adverse environmental impacts to the topography of the area that would result from the proposed project. Small changes to the topography of the area would result from the excavation of bedrock and soils for construction. Negative environmental impacts resulting from excavation of soils and bedrock are discussed in the soils and geology sections of this report.

ii. Impacts of No Action Alternative

There would be no environmental impacts to the topography of the area if the no action alternative was implemented. Topography of the area is stable and not changing.

c. Mitigation Measures

There are no mitigation measures proposed to address adverse impacts to the topography of the area because there are no significant adverse impacts to topography for the proposed Project.

Figure 1: Shows the project area with labels on the High and Low Peninsulas for reference.

3. Soils

a. Existing Conditions

A variety of soils overlies the granodiorite bedrock, including glacial till, interbedded clay, silt, sand, and gravel (District. 2014a. Geotechnical). Soil burden depths were variable over the peninsulas, ranging from 2 to 72.5 feet in depth (District. 2014a. Geotechnical). The metal and mineral composition of the soils was consistent with average soils of western Washington. Two recent landslides have occurred within the Project area recently. Previous landslide scarps are mapped in Figure 2. All previous landslides occurred within areas consisting of layered clay, silt, and sandy soils of glaciolacustrine deposits. A study investigating the threat of liquefaction near the Project facilities indicates no potential for liquefaction (Snohomish PUD, Liquefaction). All Project facilities will be founded in high strength granodiorite bedrock (District. 2014a. Geotechnical). The relative depths of bedrock to project facilities can be found in Figure 3.

Levels of antimony, arsenic, cadmium, lead, mercury, nickel, selenium, sulfur and zinc measured less than or in the normal range of Puget Sound Background Soil Concentrations (District. 2014a. Geotechnical). Chromium and copper concentrations exceeded typical Puget Sound area soil background concentrations (District. 2014a. Geotechnical). However, dissolved chromium and copper concentrations were not bioavailable. Additionally, quantities of dissolved chromium and copper are not in large enough levels to threaten water quality of Skykomish River (District. 2014a. Geotechnical). Additionally, no zones of mineralized sulfide were encountered during testing (District. 2014a. Geotechnical). Zones of mineralized sulfide can be indication of other minerals present within the rock, such as gold.

The upper soil horizon of the Low Peninsula consists of loose to dense sand with occasional gravel and silt ranging to sand and gravel with cobbles and occasional boulders (Report of Geotechnical Studies). Essentially, the upper soil horizon of the Low Peninsula consists granular alluvium material. This material ranges from 15 to 30 feet in thickness and is underlain by glacial deposits (Report of Geotechnical Studies). Glacial deposits consist of stiff to hard laminated or interbedded silt, clay, and fine sand horizons (District. 2014a. Geotechnical). A seismic refraction study of the Low Peninsula showed that the soil-bedrock interface slopes steeply down toward the west end of the Low Peninsula (Report of Geotechnical Studies). Bedrock is present at depths of 100 feet of more at the west end (Report of Geotechnical Studies).

The majority of the High Peninsula has exposed bedrock with no overlying soils (District. 2014a. Geotechnical). The High Peninsula is the proposed location for the fish screen and submerged surface intake structure (District. 2014a. Geotechnical). The area covering the two knobs along the ridge of the High Peninsula is underlain by glacial soils (Report of Geotechnical

Studies). Seismic refraction suggests that glacial deposits in these areas reaches a depth of at least 45 feet (Report of Geotechnical Studies).

b. Impacts

i. Impacts of Proposed Action

Overburden soil will need to be removed for the construction of underground tunnel, fish screen, and powerhouse. Excavation procedures for construction of Project facilities will require the use of heavy machinery (Report of Geotechnical Studies). Excavated soils and bedrock will be transported via trucks to a nearby rock quarry and a not yet determined off-site location. The proposed location of the fish screen is in the middle of the High Peninsula. Construction of the fish screen at this location will reduce excavation of soils and bedrock by about 50 percent.

ii. Impacts of No Action Alternative

There will be no significant adverse environmental impacts to the soils of the area under the no action alternative. Soils in the area are not degrading. Under the no action alternative there is still a threat of slope failure and liquefaction within the project area.

c. Mitigation Measures

Two state geologists studying the Project proposal indicate that construction impacts on existing slope conditions will be mitigated to a degree where local slope stability will improve (District. 2014a. Geotechnical). The intake structure, gate shaft, tunnels, and drop shaft will be built in bedrock substrate (District. 2014a. Geotechnical). The foundation of both fish screen and powerhouse will be set on bedrock with the walls embedded into the bedrock (District. 2014a. Geotechnical). Additionally, drainage layers located outside walls will lower piezometric pressure in surrounding soils. This will decrease the buoyancy force acting on soils and decrease the risk of slope failure (District. 2014a. Geotechnical).

Slope failure associated with excavation blasting of bedrock is unlikely to occur with the appropriate precautionary measures that will be taken by the PUD during construction (District. 2014a. Geotechnical). Micro-second delays within each blasting round will reduce the magnitude of seismic vibrations (District. 2014a. Geotechnical). Contractors that are performing excavation work will be required to retain a blasting consultant to review the blast designs and resulting blasts (District. 2014a. Geotechnical).

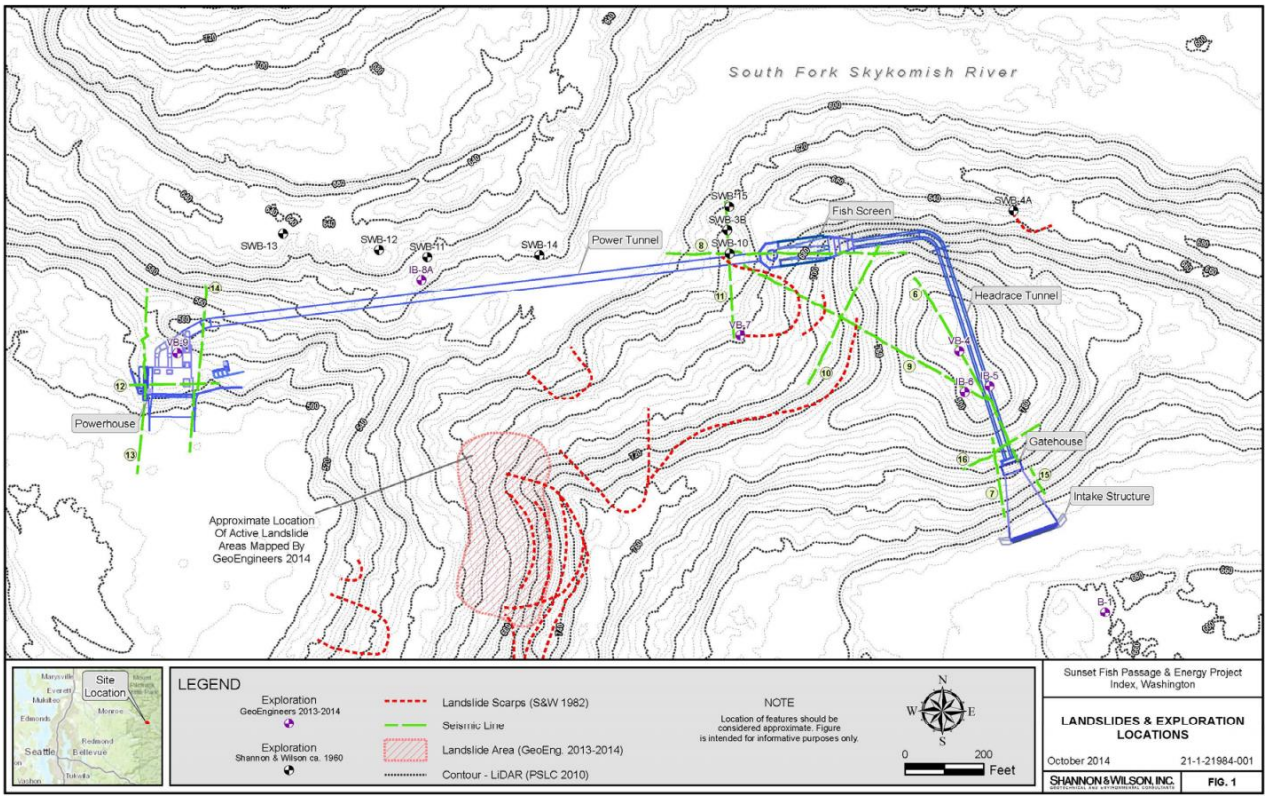


Figure 2: Shows landslide scarps in relation to Project Facilities. Contour lines are also mapped in black. Seismic line refers to areas that were tested for soil depth and composition.

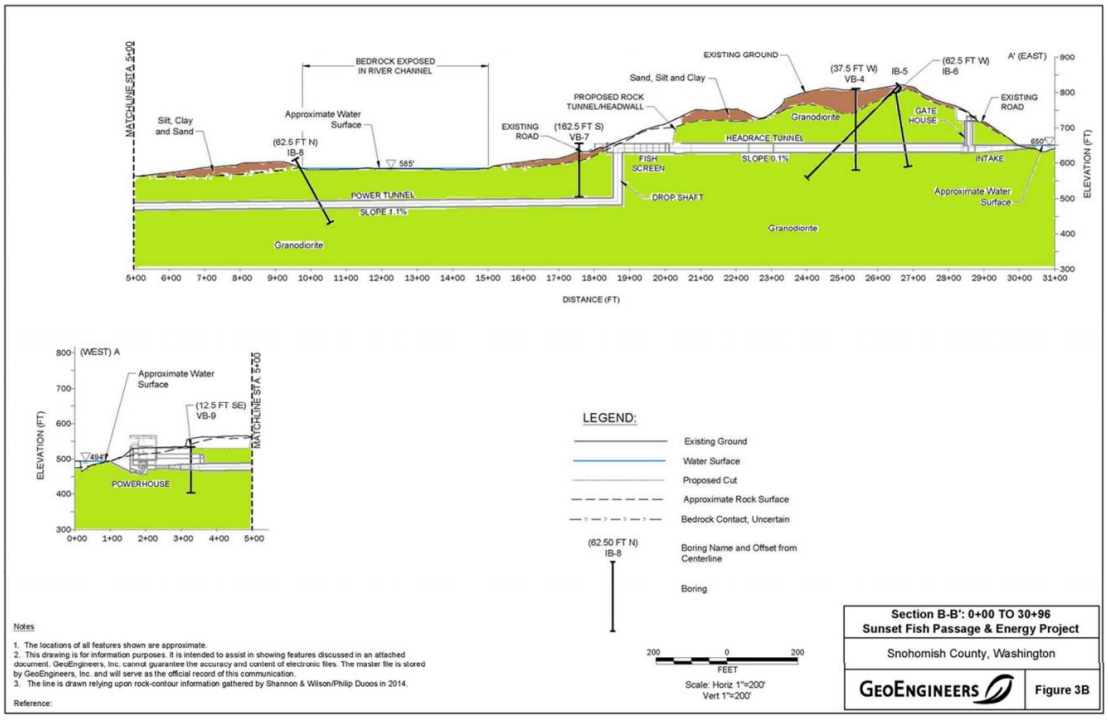


Figure 3: Shows the depth and distribution of bedrock and soils in relation to project facilities. The green area shows bedrock areas. The brown colored areas show soils. Locations in this figure are approximate. Depths are a mixture of interpretation and measurements.

4. Unique Physical Features

a. Existing Conditions

The South Fork of the Skykomish River at Sunset Falls is the proposed location for this project due to a unique deep water pool located at the top of Canyon Falls (District. 2014a. Geotechnical). Just above the deep water pool, the river makes a sharp 180 degree turn. This abrupt change causes water to hit the southeast side of the High Peninsula where it is deflected downward as well as downstream. The erosional force from river water forced downward results in the scouring of the bedrock and the formation of a deep water pool with bedrock substrate. The deep water pool is stable. There is little risk of sediment filling the pool. Currently, river flows must be above 7,000 cfs for cobble sized sediment to be transported into the pool.

b. Impacts

i. Impacts of Proposed Action

Diversion of water from the deep water pool into the underground tunnel will result in lower flows through the pool and the 1.1-mile bypass reach downstream of the pool. The change of flow levels of the Skykomish River will result in changes erosional and depositional properties of the river. Over time this will effect of the bathymetry of the deep water pool. The pool could be filled by sediment, or the location of the scour pool could change. However, granodiorite is strong and not easily eroded. Therefore, a change in the location of the scour pool is highly unlikely to occur within the lifespan of the Project because the substrate of the pool is bedrock. A study conducted by the Northwest Hydraulic Consultants on erosional and sediment properties of the River showed that diversion of the river for the hydro Project would not result in increased sedimentation to the deep water pool.

ii. Impacts of No Action Alternative

There will be no significant adverse environmental impacts to the deep water pool under the no action alternative. The erosional and sedimentation properties of the river would remain the same. Therefore, the pool would remain the same.

c. Mitigation Measures

There are no mitigation measures to ensure the stability of the deep water pool. The deep water pool has been stable for at least 30 years because the area was investigated for a hydro project in the early 1980s. According the Northwest Hydraulic Consultant's investigation, the deep water pool is stable. No mitigation measures are necessary.

5. Erosion/enlargement of land area (accretion)

a. Existing conditions

Approximately 2 miles upstream of the Project area there is a cascading falls called Eagle Falls (River Hydraulic). Eagle Falls is naturally formed bedrock constriction for the river sediment transport (River Hydraulic). Eagle Falls constricts the flow of the Skykomish River through a natural bedrock channel that is narrow. This attenuates flows over the falls because water gets backed up as it is forced through a narrow river channel. Lower flows result in a lower carrying capacity. Therefore, Eagle Falls limits the amount of sediment that is transported to the Project area. A series of pools and riffles immediately downstream of Eagle Falls additionally limit downstream sediment transport as transported sediment is deposited in the pools where river discharge is lower (River Hydraulic). After this series of pools and riffles the river straightens and transport capacity becomes high (River Hydraulic). There is a sediment bar located on the inside shoreline of the 180-degree bend (River Hydraulic). Erosion of this sediment bar consists of episodic large eroding events during high flows rather than gradual erosion (River Hydraulic). The sediment that is transported to the pool is typically concentrated on the inside of the bend (River Hydraulic). However, in highly turbulent environments with large sediment supply, sand and gravel can get pushed to the outside bend to the proposed location of the surface intake structure (River Hydraulic). Currently, a river discharge of 7,000 cfs is required to transport cobble sized sediments into the deep water pool at the proposed intake site (River Hydraulic).

The Northwest Hydraulic Consultants' field based assessment suggests that river channel migration and sediment transport appear only occur during large flooding events (River Hydraulic). Erosional patterns of large boulders indicate that the erosional properties of the river have been fairly consistent over past decades (River Hydraulic). Substrate at the Project site is mobile during relatively common flood events, such as 2-year recurrence interval flooding events (River Hydraulic). The stability of the channel morphology is predominately due to the bedrock restraints on the river both at the surface intake structure site and downstream of the rail bridge (River Hydraulic). These bedrock outcrops constrain lateral and vertical migration of the channel (River Hydraulic).

There is a deposit of glaciolacustrine sediment along the right bank of the river just upstream on the railway bridge (River Hydraulic). Along this small section of the river the bank is progressively eroding and undercutting (River Hydraulic). Continued erosion of this bank could result in slow channel migration. The study predicts that without any bank stabilization, river channel migration along this bank is probable in 20 to 50 years in the absence of large floods (River Hydraulic).

b. Impacts

i. Impacts of Proposed Action

Diversion of water from the South Fork of the Skykomish River could lead to changes in the carrying capacity and transport power of the river. Additionally, the diversion of water from the pool will likely change

riffle inflection and consequently erosional and depositional properties of the River (River Hydraulic). However, these impacts would not be significant due to the bedrock substrate river channel. Despite any changes to the erosional properties of the river, the granodiorite bedrock is not easily eroded and the bathymetry of the pool will stay the same. Erosional power of the river is high during peak flows and flooding events. During peak flows and flooding events hydroelectric operation would stop.

ii. Impacts of No Action Alternative

Erosion of the right bank of the river just upstream of the rail bridge would continue as in the proposed action. Due to the fact that several residential buildings are located on the peninsula and existing railway structures are in place, bank stabilization methods will likely be employed as erosion of this bank continues.

c. Mitigation measures

In the future mitigation measures will be necessary to prevent erosion. However, bank stabilization structures are not needed currently and will not be implemented until necessary. (River Hydraulic).

Earth for Alternative Action

Existing Conditions for Alternative Action

The Alternative Action Project area is located at Wild Horse Wind Farms approximately 16 miles east of Ellensburg, WA (Wild Horse Wind and Solar Facility & Renewable).

This area is geologically part of the Columbia River Basalt Plateau (Harrison. 2008). The Columbia River Basalt Plateau consist of three dominant rock types (Dawes and Dawes. 2013). The bedrock that underlies the region is basalt. This basalt formed between 14 and 17 million years ago as the results of successive flows of basalt (Harrison. 2008). The basalt bedrock is found as either pillow basalt or columnar basalts (Dawes and Dawes. 2013). Pillow basalts form when mafic lava erupts into water (Dawes and Dawes. 2013). There are also deposits of diatomite throughout the Alternative Action Project area (Dawes and Dawes. 2013). Diatomite is formed from the hard exoskeletons of diatoms composed entirely of silica (Dawes and Dawes. 2013). Around the area there are also large amounts of petrified wood (Dawes and Dawes. 2013).

The wind turbines would be located on the ridge tops within the Whiskey Dick Mountain region. The landscape of this region is composed of large rolling hills, steep flat topped mesas, and narrow stream canyons. Elevations range from 550 feet to 3,200 feet above sea level (L.T. Murray Wildlife Area). The summit of Whiskey Dick Mountain is around 3,850 feet (Whiskey Dick Wildlife Area). Vegetation consists of shrubs and grasses (L.T. Murray Wildlife Area). Sagebrush and bitterbrush are dominant shrubs (L.T. Murray Wildlife Area). Bunchgrasses are dominant grasses (L.T. Murray Wildlife Area). There are a variety of wildflowers in the area including, bitterroot, balsamroot, cushion daisy, sunflower, and lupine (Whiskey Dick Wildlife Area). The majority of vegetation is located near small streams that flow throughout the area. Soils

along ridge tops are minimal and basaltic bedrock is exposed in a lot of areas. Alternative action project facilities would be mounted into basaltic bedrock (WHWPP, Chapter 3).

Impacts of the Alternative Action

Environmental impacts to Earth resources of the proposed alternative action would occur during the construction period of the project. Short-term impacts to soils and geology during construction include vegetation clearing and excavation of soils and bedrock to install wind turbines. Grading and filling for construction and maintenance of access roads would also adversely impact Earth (WHWPP, Chapter 3). These activities could lead to increased erosion of the area (WHWPP, Chapter 3). Erosion could result in increased sedimentation to surface water features, gully erosion, slope instability, slope failure, debris flows, and rock falls (WHWPP, Chapter 3).

To build eighteen wind turbines, a total of 47 acres will be disturbed during construction (WHWPP, Chapter 1). A total of 21.45 acres would be permanently impacted by the base pads of wind turbines (WHWPP, Chapter 1). For each turbine, a crane pad area of 3,000 square feet would be graded and covered with gravel fill (WHWPP, Chapter 1). These crane pads are used only for installation of turbines. Approximately 7,000 cubic yards of imported sand and gravel will be needed for construction (WHWPP, Chapter 1). Excavation of parent material will be around 43,000 cubic yards of material (WHWPP, Chapter 1). These figures were extrapolated from a previous EIS complied for initial development of Wild Horse Wind and Solar Facilities. The initial figures included excavation and construction need for access roads and transmission lines. For the proposed alternative action some of these facilities are already in place. The figures suggested for the expansion of Wild Horse Wind and Solar Facilities do not adjusted for existing facilities. Therefore, excavation and sand/gravel imports will likely be much less than suggested here.

Mitigation Measures for Alternative Action

To reduce erosion during construction certain mitigation measures will be taken. Where possible, the original vegetation landscape will be retained. After construction, crane pad areas used for the installation of turbines will be reseeded with natural vegetation. During construction the crane pad areas will be surrounded with straw mulch and hay bales to prevent runoff from these locations. Disturbed and exposed surfaces will be covered with straw mulch to prevent rain water runoff and wind-blown dust. Additionally, surface water runoff will be directed away from disturbed barren areas through the use of hay bales surrounding the construction sites. A vegetation riparian buffer between exposed soils and nearby receiving waterways will reduce transport of sediment into water.

During an earthquake, wind turbine operations will be shut down temporarily. All wind turbines will be outfitted with seismic vibrations detectors that would shut down operations if an earthquake is detected. Operations will resume when it is deemed safe. Similar procedures will be implemented in the case of a nearby volcanic eruption.

Alternative action project facilities will be located on low-gradient topography and securely mounted in basaltic bedrock to avoid risk of landslides. Additional

geotechnical explorations of proposed turbines sites will ensure areas of development are not prone to slope failures, and that wind turbines are built at safe distances from any areas that are prone to landslides. These geotechnical studies will include site specific ground drilling and ground-penetrating radar surveys.

Air for Proposed Action

1. Air Quality

a. *Existing Conditions*

Washington State has several groups who work together in order to maintain and measure air quality. They are Ecology, Environmental Protection Agency, tribes, and local clean air agencies. The agency that monitors Snohomish, King, Kitsap and Pierce County is the Puget Sound Clean Air Agency. Monitoring stations measure fine and larger particulates, ozone, carbon monoxide, lead, nitrogen dioxide, and sulfur dioxide. There are three stations near the project site, in Darrington (31 miles to the north), North Bend (25 miles to the south), and Marysville (33 miles to the northwest) and each of them reports small particulates and North Bend also reports ozone. No other information about the criteria pollutants is available from those stations. According to The Puget Sound Clean Air Agency, the three stations each report air quality as "good" for most months. In Winter months air quality in each is often reduced to "moderate", possibly because of burning of wood to heat homes. In the summer air quality has dropped to "unhealthy" when forest fires occur nearby (District. 2016b).

b. Impacts

i. Impacts of Proposed Action

Air quality will be affected during construction. The construction period is 30 months long with Phase 1, the first three months, involving the heaviest construction. During this stage there would be increased traffic due to trucks coming and going from the site. In a study prepared for Snohomish PUD, it was found that during Phase 1 there would be an estimated 300 total daily truck trips per day hauling materials from the site. These increased truck trips would result in the addition of 148 metric tons of carbon dioxide to the environment (District. 2014c.).

There would also be an increase in fugitive dust during excavation of the land (District. 2014c.).

After construction, the Project would contribute no carbon dioxide, methane, or other potentially significant gases. By using this hydropower project instead of burning fossil fuels for energy, approximately 50,000 tons of carbon dioxide will be saved each year (District. 2016b).

ii. Impacts of No Action Alternative

If the site remains the same, no increased truck traffic would occur. The air quality would remain the same as existing conditions.

c. Mitigation Measures for Project Action

Trucks are the most feasible means of transporting machinery and materials to and from the site. Since the impact of their exhaust will be temporary, no mitigation will occur. There will be a blasting plan designed to reduce fugitive dust (District. 2016b).

2. Odor

a. Existing Conditions

The Project site currently has odors associated with nearby residential use, such as vehicle exhaust and wood fires. These are not measurable (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

Increased truck traffic and construction would increase odor temporarily. After the Project is completed, odor will return to Existing Conditions.

ii. Impacts for No Action Alternative

Odor would not be affected because truck traffic would not change. There is the potential for new houses to be constructed and the increase of residential odors.

c. Mitigation Measures

There are no plans to mitigate odor during construction because it is temporary.

3. Climate

a. Existing Conditions

The Cascade Mountain Range and other topographical features strongly influence climate in the Project region. The area experiences moderate winters and summers (Table 2). Average temperatures in Snohomish County are 64 degrees Fahrenheit in the summer and 39 degrees Fahrenheit in the winter (District. 2016b).

Table 2: Temperature Summary for Project Vicinity, 1924-2012 *

Month	Monthly Average (°F)			Daily Extreme (°F)	
	Max	Min	Avg	High	Low
January	45.4	32.9	39.1	68	-8
February	50.2	34.6	42.4	77	-4
March	54.1	36.2	45.1	83	6
April	60.2	39.4	49.8	90	17
May	66.6	44.1	55.3	102	27
June	71.1	48.4	59.7	106	31
July	77.0	50.6	63.8	104	35
August	77.2	50.6	63.8	100	36
September	71.5	47.1	59.3	98	30
October	61.8	42.0	51.9	92	19
November	51.7	37.5	44.6	78	4
December	46.1	34.1	40.1	67	3
Annual	61.1	41.5	51.3	106	-8
Winter (Dec – Feb)	47.2	33.8	40.5	77	-8
Spring (Mar – May)	60.3	39.9	50.1	102	6
Summer (Jun – Aug)	75.1	49.9	62.5	106	31
Fall (Sep – Nov)	61.7	42.2	51.9	98	4

*Note: Based on the Western Regional Climate Center (WRCC) for Startup, WA, located just west of Gold Bar. Source: WRCC 2012.

West Snohomish County receives an annual average rainfall of 35 inches and the eastern part of Snohomish County receives more rain, frequently exceeding 100 inches per year. Most rain occurs during late fall through early spring with summers being warm and dry (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

The Project would not significantly affect climate in the region because most of the impacts are temporary.

ii. Impacts of No Action Alternative

No action would result in no significant climate changes other than natural environmental climate changes.

c. Mitigation Measures

No mitigation efforts are proposed for climate because the impacts of the project are temporary.

Air for Alternative Action

Existing Conditions for Alternative Action

The existing area is one of agriculture that is regularly disturbed by heavy equipment. Vehicle exhaust and fugitive dust emissions are regularly occurring. The area has strong prevailing winds (Wild Horse Wind Power Project Final EIS Chapter 2, 2005).

Impacts for Alternative Action

During construction the power sites will be under excavation and vehicles will be producing exhaust and fugitive dust. Those would be temporary and would not have long term significant impacts. Exhaust and dust produced will not cause air quality to drop below applicable air quality standards. There would also be long term maintenance required that would produce exhaust and fugitive dust. These have also been determined non-significant in quantity. Any odor from vehicle exhaust would be distributed because of the strong winds and would not be significant. There will be no odor or emissions after construction is completed. To produce an equivalent amount of electricity using natural gas would produce an excess of 50,000 metric tons of carbon dioxide annually (Wild Horse Wind Power Project Final EIS Chapter 2, 2005).

Mitigation Measures for Alternative Action

During construction, vehicles will comply with applicable federal and state air quality regulations for emissions, idle time will be limited by turning off equipment when not in use, traffic speed on unpaved roads will be reduced to 25 mph to keep fugitive dust low, dust will be suppressed using water-based liquids in compliance with state and local regulations, worker carpool will be implemented to reduce car trips, plantings will occur in disturbed areas to keep dust low, water sprays will be used on rock crushers to reduce fugitive dust, and during high wind some processes may be shut down. If necessary, dust control measures will be implemented after construction (Wild Horse Wind Power Project Final EIS Chapter 2, 2005).

<u>Water for Proposed Action</u>

1. **Surface water movement/quantity/quality**
   a. *Existing Conditions*

The South Fork Skykomish River is formed at the confluence of the Tye River and the Foss River, located upstream from Skykomish and just south of Index, WA. Natural sources of sedimentation into the South Fork Skykomish river include soil creep and landslides (District. 2016b). The annual sediment load for the South Fork Skykomish River near Index is estimated to be approximately 200,000 tons annually (District. 2016b).

With variable monthly flows, peak flows occur between November and January low flows occur between May and June. The mean average flow of the South Fork Skykomish River at Sunset Falls has been recorded at 2,451 cfs (DLA Section E, 2016). The highest flow ever recorded in this area was on November 6, 2006, reaching a peak flow of 129,000 cfs, while the lowest flow ever recorded occurred on August 26, 2015 at a rate of 188 cfs.

The District has stated that the river possesses a "distinctive hydrology" that showed a fall/winter flow rate "… generally between 1,000 – 2000 cfs" and a spring/summer flow rate "…generally between 2,000 – 5,000 cfs" (SP1: Water Quality Study Final Technical Report). Flow increases have been documented during the month of October when regular storm events occur. A dynamic range of hydrologic conditions including dry, normal and wet years suggest that a system of highly variable flows exists, with multiple peak flows in a given year (SP 9: Aesthetic Resource Study Final Technical Report). The current conditions

are due to mountain and glacial melt that modifies flow with variations in temperature as seasons change.

b. Impacts

i. Impacts of Proposed Action

The proposed Project will maintain a minimum instream flow of 250 cfs through monitoring at a current compliance gage (formerly known as USGS Station No. 12133000). A maximum of 2,530 cfs of water will be diverted to the Project for operation. Operational conditions for the Project are as follows: when instream flow rises to 1,000 cfs above minimum instream flow (250 cfs), both 15 MW turbines will become active and will balance the diversion of water at 500 cfs each. When instream flows rise to 2,500 cfs above minimum instream flow (250 cfs), the two turbines will run at full capacity, balancing the highest diversion of water possible at 1,250 cfs each. When instream flow rises above 8,000 cfs, the Project will cease operation and shut-down immediately. Operational flow guidelines by month for the proposed Project are listed in Figure 2.

The District will provide additional flow necessary to operate the existing Trap-and-Haul Facility located at the base of Canyon Falls, operating the hydropower facility only at times of acceptable instream flows. The District will also extensively measure and record monthly fluctuations in stream flow for a determined amount of time. The diversion of water from the river is planned to be approximately "3% under high flow condition and 90% under low flow conditions" (Revised Study Plan).

During the construction phase of the Project, the likely disturbance of soils and organic materials is increased during activities that will improve the current Trap-and-Haul facility (DLA Section E, 2016). In addition to significant concerns about river sedimentation, there are also concerns raised about runoff produced during construction, likely causing spoils (or rock leachates) and uncured concrete to have an effect on conductivity, pH, turbidity, and metals within the Project area (DLA Section E, 2016).

ii. Impacts of No Action Alternative

Northwest Hydraulic Consultants (NHC) concluded that the deep-pool near the proposed intake reach is unlikely to shift position over time under the "No Action" alternative (River Hydraulic). Under the "No Action" alternative, water quality will not experience short-term degradation of water sources (ie: gas and diesel runoff) during the construction of Project facilities.

c. Mitigation Measures

Sampling of water quality will be conducted at three sites: upstream of the intake, downstream of the bypass reach and downstream of the proposed powerhouse. Testing locations can be found below in Figure 1. The District will also adhere to "quality control" assurance, meaning that both precision and accuracy will be accounted for when defining standards for each testing component and assessment. However, some of these reports that state

construction will generate significant solid waste that could enter waterways and ultimately degrade water quality (Erosion and Sediment Control Plan Outline). The District has also stated that the proposed Project will not increase the chances of "sedimentation of medium to coarse gravel sized material near the intake" and that mitigation measures for reducing sedimentation near the intake are not necessary (DLA Exhibit A, 2016).

Lateral and vertical channel migration is unlikely due to the prevalence of stable bedrock in the Project area. Preference will be given to construction activities that strive to only use cement when there is minimal to no contact with water. Another provision seeks to perform "in-water work" during "…low-flow conditions and using work-area isolation, as appropriate" (SP1: Water Quality Study Final Technical Report).

In addition to provisions set forth by the District, this report recommends an additional provision requiring a minimum instream flow of 400 cfs at the Compliance Gauge. Flows will continue to be monitored at the current location of the compliance gauge in the bypass reach (formerly known as USGS Station No. 12133000). This additional provision will ensure that minimum instream flows for fish are properly maintained. This provision is also unlikely to affect energy generation of the proposed Project because seasonal variations of instream flows often require project shut-downs for extended periods of time during the winter months. Project operation during the winter will only occur during typical storm events, provided instream flows do not exceed 8,000 cfs. A list of median instream flows by month is located in Figure 2.

Figure 4: Testing locations upstream of the intake, downstream of the bypass reach and downstream of the proposed powerhouse.

Table 3: Parameters measured under the WQMP. Testing frequency is both site and parameter specific.

Parameter	Upstream Reference (RM 52.6)	Bypass (RM 51.7)	Tailrace (RM 51.5)	Timing	Frequency
Discharge	X	X		Hourly, year-round	Annual
Water Temperature	X	X	X	Hourly, year-round	Annual, Years 1 through 5
Water Temperature	X	X	X	Hourly, May through October	For license period
Dissolved Oxygen	X	X	X	Hourly, June through October	Annual, Years 1 through 2
pH	X	X	X	Hourly, June through October	Annual, Years 1 through 2
Total Dissolved Gas			X	Hourly for two select one-week periods when mainstem discharge is between 2,000 and 3,500 cfs	Annual, Years 1 through 2
Turbidity			X	Hourly, October and November	Annual, Years 1 through 2
Heavy Metals			X	Monthly, October and November	Annual, Years 1 through 2
Hardness			X	Monthly, October and November	Annual, Years 1 through 2

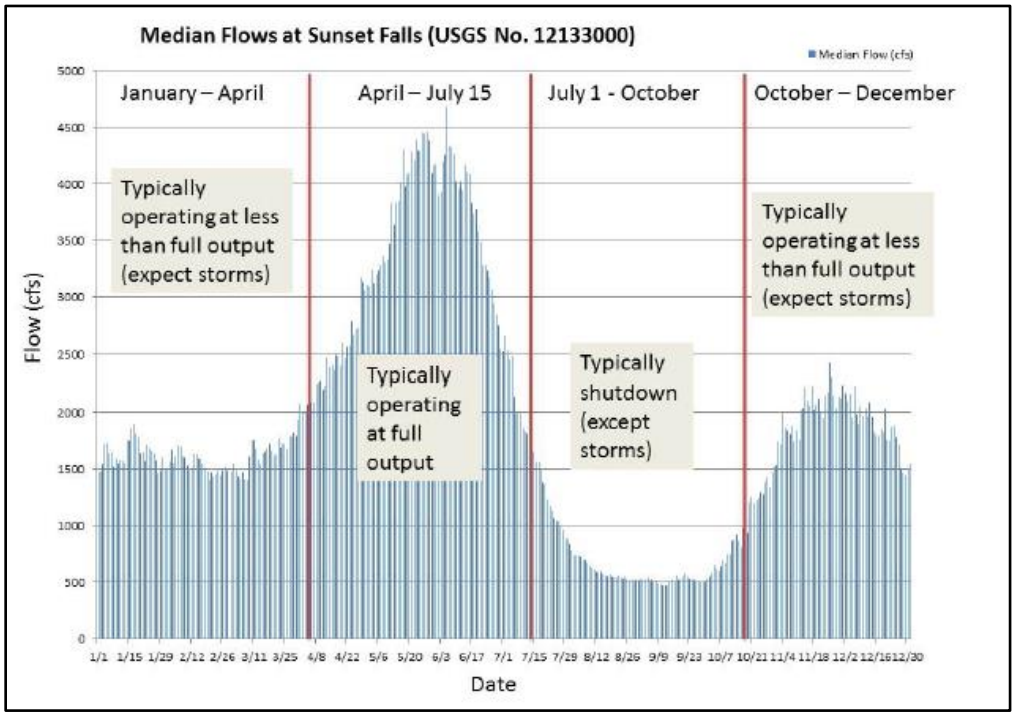


Figure 5: Monthly median flows at Sunset Falls. Typical Project shut-down from mid-July to mid-October

2. Runoff/Absorption

a. Existing Conditions

The South Fork Skykomish River drains over 360 square miles of forested timberland in the southeastern corner of Snohomish County. Flows in the Project area are driven through a steep drop, largely comprised of solid granodiorite

bedrock. Seasonal variation in runoff occurs due to variable glacial melt that modifies stream flow (DLA Exhibit, 2016).

b. Impacts

i. Impacts of Proposed Action

It is likely that runoff that could be higher than typical under the currently proposed Project due to requirements that include the clearing of vegetation from nearby landscapes to allow construction equipment to travel safely *(Erosion and Sediment Control Plan Outline)*. The alteration of flow proves be likely, as the "…proposed Project would alter the natural flow regime in the Project's bypass reach" (SP16: IHA/RVA Study Final Technical Report). Sub-optimal flows might also stem from other related variables such as the presence of bedrock materials that channel water at high gradients, raising the potential for increased runoff. These impacts appear to be short-term as construction occurs.

ii. Impact of No Action Alternative

The No Action Project alternative will neither increase nor decrease the potential for changes in runoff/absorption due to the elimination of provisions that require clearing nearby vegetation buffers. Slope stability will remain in its present state and changes to runoff rates will not be positively or negatively affected under this scenario.

c. Mitigation Measures

The construction phase of the Project will require clearing nearby vegetation for construction access and building. The District will implement a Terrestrial Resources Management Plan (TRMP) to revegetate and restore the Project area. Preference will be given for the construction of gravel roads to mitigate increased runoff effects associated with impervious surfaces. The implementation of these mitigation measures has the potential to actually increase slope stability and improve current runoff conditions in the future.

3. Floods

a. Existing Conditions

The Project area lies within an area that historically experiences occasional flooding events due to presence of steep surrounding slopes. According to the District, areas above Canyon Falls are subject to typical flooding events every year (DLA Section E, 2016). The Federal Emergency Management Agency (FEMA) has estimated that the Project area is near the historic 100-year flood zone and is located "…approximately 40 feet from the shoreline" (District. 2016b). Flooding generally occurs during the rainy, winter season with the majority of flood events happening in the month of October. Flooding events are heavily influenced by heavy-rain events during the winter and are also subject to fluctuations in streamflow due to variable glacial melt (DLA Exhibit A, 2016).

b. Impacts

i. Impacts of Proposed Action

The proposed Project is unlikely to have significant positive or negative impacts associated with typical flooding events. Project

operation will shut-down when instream flows rise above 8,000 cfs and will only continue operation when flows fall below this rate. The District has stated it does not plan to "…impede the annual downstream transport of sediment or woody debris" (DLA Exhibit A, 2016).

ii. Impacts of No Action Alternative

Under the No Action scenario, flooding events will continue to occur typically during the rainy, winter season. Woody debris and river sediment will continue to be able to accumulate at current rates in the absence of additional anthropogenic intervention. Flooding upstream of both of the falls will be unimpeded to drive materials downstream in events of high instream flows.

c. Mitigation Measures

The proposed Project will not implement plans for flood control and the District has stated it will not "…impede the annual downstream transport of sediment or woody debris" (DLA Exhibit A, 2016).

Monitoring instream flows at the proposed intake provides flexibility to either "…increase or decrease generation to maintain instream flows" (DLA Exhibit A, 2016). When instream flows exceed 8,000 cfs, Project operation will shut-down to prevent "…entraining debris during flood-events" (DLA Exhibit A, 2016).

4. Groundwater movement/quantity/quality

a. Existing Conditions

In general, peak ground water inputs occur between August and mid-October. After mid-October, flows increase in the winter with the return of frequent precipitation patterns and storm events (District. 2016b). Water Surface Elevation (WSE) for ponds within the project area remains relatively constant during events of heavy precipitation. This has led the District to conclude that the majority of side channels on the river are "hydrologically-disconnected" from South Fork Skykomish River", suggesting that these resources are more reliant on groundwater deposits (Appendix 7: Trip Completion Report on Monitoring Water Surface Elevations).

Several miles outside of the Project boundary exists a number of abandoned copper mines that have been ruled out for monitoring under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Citing studies conducted from 1972 to 1992, the District has stated that results showed a significant "… presence of oily seeps to the South Fork Skykomish River" (*DLA Section E, 2016)*. In 1991, the initial reports conducted by the Department of Ecology identified "…benzene, lead, polychlorinated biphenyls (PCBs), toluene, and pyrene" within the Project vicinity (SP1: Water Quality Study Final Technical Report). The District indicates that the sources of these contaminants have been completely removed. The recent construction of a town wastewater treatment system helps to ensure water quality in this area.

b. Impacts

i. Impacts of Proposed Action

The possibility of groundwater contamination within the project area is increased due to vegetation clearing necessary for the construction of the Project facilities. The chances of runoff are increased, translating to a possible increase in absorption and consequently an increase in groundwater entering the water table. Construction equipment will need to occupy these cleared lands and the District will comply with proper revegetation after the construction phase. These effects prove to be temporary with construction activities and do not pose any significant long-term negative threats to groundwater resources.

ii. Impacts of No Action Alternative

The No Action alternative does not pose any significant positive or negative impacts to groundwater quality/quantity in the Project area. Without further human interaction, the South Fork Skykomish River will continue to typically receive peak groundwater contribution in the winter months during heavy flooding events. No action will neither degrade nor improve these conditions.

c. Mitigation Measures

The construction phase of the Project is likely to spill harmful substances (ie: hydraulic fluid, diesel/gas, etc.) onto soil where it can seep into groundwater. The District's Erosion Sediment Control Plan (ESCP) will require interception and control of "…accidental oil, gas and electrical component releases in the project area" (District. 2016b). The ESCP will dispose of harmful waste materials such as "... any solid waste, wastewater, organic waste, excavated materials, or hazardous waste generated during construction" (District. 2016b). I addition, the District will begin any "ground disturbing activities" after harmful materials and sediment controls have been permanently replaced *(Erosion and Sediment Control Plan Outline)*.

5. Public water supplies

a) Existing Conditions

The District has filed a formal application for groundwater rights and as of 2012, there are not any new applications for groundwater rights. Other than the District, only one other party has applied for a surface water right (District. 2016b).

A number of private water right claims within the study area, including "…18 groundwater claims, 1 groundwater right, 29 surface water claims, 18 surface water right certificates, and 2 applications for surface water right permits" (District. 2016b). Issued in 1957 during construction, a non-consumptive surface water permit was issued for running the existing Trap-and-Haul Facility at a rate of 180 cfs for fishery operation. However, WDFW only diverts 65 cfs during operational hours.

b) Impacts

i) Impacts of Proposed Action

When in operation, the District indicates that the proposed Project will provide benefits that include access to reliable, low cost energy. Initial Project designs utilized the construction of an artificial

weir structure to stabilize water levels for wells and surface water diversions. The current Project design has eliminated the artificial weir and as a result will not provide any additional stabilization resources for surface water diversions or wells upstream of the current intake area. The bypass reach will not be adversely affected by the removal of the artificial weir design. This information was provided to the District by an external consultant Robinson Noble who reviewed "…well logs for 22 wells", finding only one of which considered to be currently active (District. 2016b). Noble's report has indicated that Project operation will not affect the active well because the proposed Project will "…not affect water levels at this depth" (District. 2016b).

ii) Impacts of No Action Alternative

Under the "No Action" alternative, public water supplies will not be positively or negatively affected. The diversion of the South Fork Skykomish River will not impact the ability to supply water to local residents or current water users.

c) Mitigation Measures

The proposed Project does not provide any mitigation measures for public water supplies. Since the Project will not diminish public or private water sources (ie: wells, springs, etc), there is no need to implement such measures.

Water for Alternative Action

Existing Conditions for Alternative Action

There are no notable streams or waterways within the Project area. There is an unnamed spring source east of an existing turbine, "located approximately 200 feet away" from the Project area (WWHPP Final EIS Chapter 3). The alternative Project poses no significant impacts that to these particular resources.

Impacts of Alternative Action

During the of the alternative Project, approximately 1,416,176 gallons of water are needed during the construction phase. It should be noted these energy figures are estimates based off of previous EIS draft documentation for the WHWPP.

Frequent and increasing uses of impervious surfaces during the construction of energy turbines has the potential to increase storm water runoff that will ultimately enter into waterways, which will likely cause significant negative impact to surface water quality. There are several unnamed wetlands, ponds and springs that are located near the alternative Project area. Though vegetation consistent with riparian zones was documented, vegetation didn't meet any of the requirements for wetland designation. Localized effects of the alternative Project would be experienced near drainages of minor tributaries to the Yakima River and the Columbia River. There are not any anticipated negative impacts to these resources that are considered to be significant because they are several miles away from interactions with the alternative Project.

Frequent encounters with groundwater is not expected of the alternative Project. The amount of water used during construction will not be significant because of the "temporary nature of the impact and the availability of adequate water supply" (WHWPP Final EIS Chapter 3).

Alternative Action Mitigation

The National Pollution Discharge Elimination System (NPDES) and the Clean Water Act (CWA) have policies in place to ensure water quality, quantity and manage pollutant discharge. The alternative Project will abide by state and federal regulations for storm and waste water management. Strategic placement of Project facilities will ensure that environmental health will not be diminished during construction or operation. Using only off-site water source during construction, minimizing road construction, utilizing natural drainage paths and placing structures outside of sensitive areas are all techniques that should be employed to mitigate Project impacts to water resources.

If construction is required in riparian areas, the alternative Project will seek to avoid the use of heavy equipment or machinery. Planting vegetation buffers and spreading straw mulch during construction will seek to mitigate the potential impacts of sedimentation and increased storm water runoff. When original vegetation has a preservation priority there is often less of an intrusion into local stream ecologies.

In addition to these measures, regular clean-up of trash and debris is required to maintain proper functioning of energy Projects. Water that displays "an oily sheen" will be removed and disposed in accordance with e federal and local laws (WHWPP Final EIS Chapter 3, 2005).

Plants and Animals for Proposed Action

1. Habitat and Species Diversity

a. Existing Conditions

Fish Species: The South Fork of the Skykomish River is home to many species of resident and anadromous fishes. There currently is a Washington Department of Fish and Wildlife (WDFW) Trap-and-Haul Facility located just below Sunset Falls at the project site. Before this facility was built in 1958 there were no anadromous fish living upstream of the falls (SP12: Downstream Fish Passage Assessment at Falls Study Final Technical Report). Sunset Falls acts as a natural barrier to upstream movement for both the resident and anadromous migratory species. Since this facility has been running they have collected data and determined that eight anadromous fish use the habitat within the proposed Project Area and are in need of upstream transport. These species include Chinook (*Oncorhyncus tshawytscha*), Coho (*O. kisutch*), Pink (*O. gorbuscha*), Sockeye (*O. nerka*), and Chum salmon (*O. keta*), and steelhead/rainbow (*O. mykiss*), cutthroat (*O. clarki*), and bull trout (*Salvelinus confluentus*) (District. 2016b). All eight anadromous species are collected at the Trap-and-Haul Facility and transported about 3 ½ miles upstream past three impassable barriers, Sunset, Canyon and Eagle Falls (District. 2016b). The facility has allowed for these species to access over 90 miles of spawning habitat upstream of the falls and Project site. There are also many other fish species in the South Fork Skykomish near Sunset Falls including Mountain Whitefish (*Prosopium williamsoni*), Pacific Lamprey (*Entosphenus tridentatus*), Western Brook Lamprey (*Lampetra richardsoni*), Largescale Sucker (*Catostomus macrocheilus*), Longnose Dace (*Rhinichthys cataractae*), Sculpin (Cottoidea)and Brook Trout (*Salvelinus*

fontinalis), these species do not get transported or collected by WDFW (District. 2016b).

Wildlife Species: The South Fork Skykomish River provides abundant habitat for a wide range of wildlife. There are many species of mammals, birds, reptiles and amphibians that inhabit the Project site. The species that are found near the Project site are typically those that can live in a diverse range of habitat types including forest, riparian and rural residential environments (District. 2016b). Wildlife utilize the project bypass reach to varying degrees based on their specific life histories.

Plant Species: The forests surrounding the project area were logged prior to 1933; the current land use practices have also affected the types of vegetation present. The project site is at about 650ft of elevation which is considered to be in the western hemlock forest zone (*Tsuga heterophylla* Zone; Franklin and Dyrness, 1988). The primary conifer tree species in this zone are western hemlock, Douglas-fir, and western red cedar. The hardwood tree species in this zone within the riparian buffer include red alder, big-leaf maple, and black cottonwood (District. 2016b). The over story has remained unchanged on most of the project land; however, the understory species have been modified due to development in the area. The composition of the mixed stands in the area is very important because they provide habitat and refuge for the wildlife species (District. 2016b). The riparian vegetation especially plays an important role in the stabilizing of stream banks, sediment and nutrient filtration as well as the recruitment of large woody debris (LWD) for fish refuge and habitat.

b. Impacts

i. Impacts of Proposed Action

The biggest impact from the proposed action on fish species would be the higher rate of injuries for downstream migrations of juvenile salmonids during low instream flows. There would be an increased chance of mortality or injury from passing through the falls at these low flows, resulting from hitting the rocks and stream bed while migrating.

Low flows also lead to an increase in water temperature which is stressful to some species especially the highly sensitive salmonids. Low instream flow in the bypass reach would likely be caused due to the removal of water from the deep pool intake. This may alter the stream's composition of biota and adversely affect the native resident and anadromous fishes using the bypass reach habitat. (District. 2016b)

Other impacts could include temporary increases in turbidity, and spills of hazardous substances and fuels due to the construction. These may have an impact on fish, wildlife and plant species and their habitat. During the construction of the intake, power tunnel, powerhouse, access roads and upgrade to the Trap-and-Haul Facility the chances of highly toxic materials entering the watershed is increased due to the presence of machinery.

Higher road use could also lead to sediments entering the river. Sedimentation also has an impact on the flow regime, which can lead to unnatural sediment budgets which are threatening to river dwelling species, especially those in the benthic zone. These are most likely temporary affects and would only be an issue during the 30-Month construction period after the construction it is likely the sediments will be flushed out down steam (District. 2016b).

During the work period, the construction noise and increased traffic could cause a temporary disturbance to wildlife, including species in the surrounding area such as bald eagles and osprey. However, this would not be a significant impact because the wildlife currently living in the Project area are adapted to the presence of traffic-associated noise and activity due to traffic on local roads and US 2, and the trains on the Burlington Northern and Santa Fe (BNFS) Railroad.

For the project construction, about 16 acres of upland, riparian, and wetland habitat will have to be altered or cleared. Only about 4 acres of the 16 would be permanently altered for the project features within the project area. This would cause a temporary significant impact until the end of construction when revegetation will be implemented (District. 2016b).

ii. *Impacts of No Action Alternative*

If the project is not constructed, the District would not be able to upgrade the WDFW Trap-and-Haul facility due to lack of funding. Therefore, the impacts of physically handling the fish and the efficiency of collecting, transporting and releasing them would remain the same (District. 2016b). This facility update would largely benefit Chinook and Bull trout. There would be no significant impact on wildlife or vegetation for the no action alternative.

c. Mitigation Measures

After the construction period, approximately 12 acres would be replanted to alleviate some of the effects of disturbance during the work period. To mitigate this the District will use native tree and shrub species, especially conifers such as western red cedar and western hemlock in the upland habitats, and cottonwoods that are present in the riparian habitats along the river banks.

To reduce the impacts of erosion and sedimentation herbaceous species will be planted to quickly grow and stabilize the soils. After the completion of the project the disturbed areas will be revegetated with native species to resemble the preexisting conditions and will likely revert to the vegetation composition within the project area prior to construction (District. 2016b).

2. Unique Species- Threatened and Endangered

a. Existing Conditions

Fish Species: Currently there are three species of fish in the South Fork that are listed as threatened under the Endangered Species Act (ESA): Chinook

salmon, winter steelhead, and bull trout. There is also one Federal candidate species found in the river, the Coho salmon, and two federal species of concern, Pacific lamprey and cutthroat trout. The National Marine Fisheries Services (NMFS) designated the areas upstream and downstream of Sunset Falls to be critical habitat for Puget Sound Chinook salmon and Puget Sound steelhead the U.S. Fish and Wildlife Service (USFWS) designated this area critical habitat for Coastal/Puget Sound bull trout (District. 2016b) (Table 4).

Table 4: List of the Federally listed species and designated critical habitats within the Project Area.

Species	ESA Status (Listing Unit)	Critical Habitat
Chinook salmon (*Oncorhynchus tshawytscha*)	ESA listed Threatened (Puget Sound ESU[1])	Designated in the Project Area
Bull Trout (*Salvelinus confluentus*)	ESA listed Threatened (Coastal/Puget Sound bull trout DPS)	Designated in the Project Area
Coho salmon (*O. kisutch*)	Species of Concern (Puget Sound / Strait of Georgia ESU)	N/A
Steelhead (*O. mykiss*)[1]	ESA listed Threatened (Puget Sound DPS)	Proposed in the Project Area
Pink Salmon (*O. gorbuscha*)	Not warranted	N/A

1 This listing applies only to winter steelhead in the South Fork Skykomish River downstream of Sunset Falls. Non-native (Columbia Basin-origin) summer steelhead in the South Fork Skykomish River upstream of Sunset Falls are not included in the Puget Sound DPS, and are therefore not listed under the ESA.

Wildlife Species: There are three Federally-listed species that could potentially inhabit the project area: northern spotted owl, gray wolf and grizzly bear, and one species proposed to be listed: fisher (District. 2016b). There are nine State special status birds that could potentially use the habitat within the project area for nesting and foraging activities: golden eagle, olive-sided flycatcher, pileated woodpecker, peregrine falcon, Vaux's swift, black swift, and merlin. Other bird species such as bald eagles and osprey utilize the areas near the project site, but none are known to nest within the project area (District. 2016b).

Plant Species: According to the Washington Natural Heritage Program (WNHP) records, there are many State special status plants in Snohomish County. A habitat that is suitable for 17 of those species is found in the project area, however none were observed in the field studies that were prepared for the District. The project area habitat has been altered and developed, and areas of high anthropogenic disturbance tend to not support rare plant species (District. 2016b) (Table 5).

Table 5: Federally listed species known or possibly occurring in the Project Area.

Scientific Name	Common Name	Status	Critical Habitat
Rana pretiosa	Oregon spotted frog	Threatened	None in Snohomish County
Brachyramphus marmoratus	Marbled murrelet	Threatened	Designated in Snohomish County
Strix occidentalis caurina	Northern spotted owl	Threatened	Designated in Snohomish County
Coccyzus americanus	Yellow-billed cuckoo	Threatened	None in Snohomish County
Lynx canadensis	Canada lynx	Threatened	None in Snohomish County
Canis lupus	Gray wolf	Endangered	None designated
Ursus arctos horribilis	Grizzly bear	Threatened	None designated
Pekania pennanti	Fisher	Proposed Threatened	None designated

b. Impacts

i. *Impacts of Proposed Action*

Impacts on the Federally-listed salmonid species include short-term instream habitat degradation, turbidity and sedimentation resulting from the instream work. This could lead to the injury or mortality of eggs, fry, and juvenile salmonids. Therefore, the proposed project will likely adversely affect the three species and their critical habitat during the project construction.

In the 16 acres of land that will be altered during the project, the vegetation being removed could affect the availability of foraging, breeding, and nesting habitat for the nine special status birds and the other wildlife species.

The construction of the project could lead to the introduction of noxious weeds and other invasive species, through that could further alter the composition of the existing ecosystem (District. 2016b).

ii. *Impacts of No Action Alternative*

If the project is not constructed, the District would not be able to upgrade the WDFW Trap-and-Haul facility due to lack of funding. Therefore, the impacts of physically handling the fish and the efficiency of collecting, transporting and releasing them would remain the same (District. 2016b). This facility update would largely benefit Chinook and Bull trout. There would be no significant impact on wildlife or vegetation for the no action alternative.

c. Mitigation Measures

The impacts caused by construction of this project will be mitigated by updating the WDFW Trap-and-Haul Facility (District. 2016b). The District will minimize the adverse effects of clearing and altering the vegetation. The District will follow the WDFW mitigation guidelines and regulatory requirements to mitigate the of impacts on the river and its riparian buffer (District 2015j).

3. Fish or Wildlife Migration Routes

a. Existing Conditions

The majority of juvenile fish that migrate downstream through the bypass reach do so in the spring and early summer. This includes all five species of Pacific salmon, as well as cutthroat, rainbow and bull trout. There are some bird species known to fly within the project area, some of which it is within their migration route, however they do not use the area as a stopover place during migrations. (District. 2016b).

b. Impacts

i. *Impacts of Proposed Action*

This project will be operated in run-of-the-river mode to minimize the impacts on the migratory fish species and their habitat. This means the project would not operate when the flows in the bypass reach are below 250 cfs ensuring the minimum instream flow requirements for fish are met. The project operations would probably decrease the juvenile injury rates that occur during the initial existing downstream migration conditions because the instream flow requirements must be followed. The proposed project conditions regarding peak flows in the period from November to July would most likely positively impact the out migrating juvenile salmon species and steelhead kelt (post spawn adult returning to salt water) ensuring their migration through the bypass reach and decreasing the risk of injury and mortality while passing through the falls. Higher rates of injury and mortality are caused by hitting the exposed rock during low instream flows in the bypass reach.

A louvered trash rack with 4-inch spaces will be installed in front of the Project intake pipe to help direct fish away from the intake (District. 2016b). A self-cleaning fish screen will be built in order to prevent the out-migrating juvenile salmon from swimming into the project intake in the deep pool and passing through the turbines. The fish screen facility will be located on the "High Peninsula" on the south side of the river. It will meet the fry criteria set by the National Marine Fisheries Service (NMFS) and will include two 88-foot-long v-shaped screens with 1.75 millimeter (mm) clear openings (District 2015j) The fish will be screened out and returned safely to the river above Sunset Falls in the Project bypass reach below Canyon Falls via a 42-inch fish bypass pipeline approximately 1,200 feet in length (District. 2016b) A fish screen creates a current that flows along the length of the screen depending on the angle of the screen, which guides the fish to the fish bypass pipeline. Only a small amount of water flows across the screen in each section ensuring that fish are not sucked onto the screen.

During the construction the noise produced by the presence of machinery and increase in traffic could also cause a temporary disturbance

to wildlife, including species in the surrounding areas such as bald eagles and osprey, potentially disrupting their flight patterns (District. 2016b).

ii. *Impacts of No Action Alternative*

The no action alternative would have no significant impacts on migratory species and their respective migration routes.

c. Mitigation Measures

Mitigation measures for fish include maintaining minimum instream flows of 250 cfs in order to maintain appropriate water temperatures in the river below the intake pool and downstream of the power facility as well as flow levels needed for the Trap-and-Haul Facility fishway operations. The Project will not run when the instream flows at the intake are not adequate to maintain the 250 cfs criteria. The project operations are required to take into consideration the State water quality standards for temperature (District. 2016b).

Plants and Animals for Alternative Action

Existing Conditions for Alternative Action

Plants: The proposed project site is full of undisturbed lands and wildlife habitats. The area is part of the shrub-steppe habitat. According to WDFW this is a priority habitat comprised of a vegetation community that consists of layers of perennial grasses with an irregular distribution of a layer of shrubs. This habitat type is most commonly found in eastern Washington landscapes. A portion of the project area is found within the Whiskey Dick Wildlife Area. Many of the plant communities in this area have been altered due to livestock grazing, introduction of invasive and nonnative plant species, and recreational activities. These have caused a change to the plant composition in the area (Wild Horse Wind Power Project Final EIS Chapter 3, 2005).

Wildlife: Based on the characteristics of shrub-steppe habitat, the project area could provide suitable habitat for birds such as raptors and grouse as well as big game. In some areas riparian and forest-dependent species could be found. Federally Threatened and Endangered species that could potentially inhabit the area include bald eagle, gray wolf, Canada lynx, northern spotted owl, western sage grouse, and western yellow billed cuckoo (Wild Horse Wind Power Project Final EIS Chapter 3, 2005).

Impacts for Alternative Action

Plants: During construction, operation and maintenance of the wind turbines in the area, the habitat could be subject to the introduction of invasive and nonnative plant species. The roads built for construction and maintenance could act as a distribution network for seeds and plant parts being carried incidentally with materials for the eighteen new turbines., introducing species to the recently disturbed areas and those that were previously weed free (Wild Horse Wind Power Project Final EIS Chapter 3, 2005).

Wildlife: The construction of the project facility can directly affect the loss of wildlife habitat, and indirectly can have an impact on the wildlife in the area. These indirect impacts include disturbance by the wind turbines themselves, and habitat fragmentation due to the roads built and human activities during the construction, operation and management of the project site.

These impact different species such as bats, big game, other mammals, amphibians, reptiles, and birds, as well as having an impact on the state and federally listed species. Specifically, during the construction time, elk and mule deer are likely to be temporarily displaced from the habitat within the area due to the presence of people and construction equipment. The other major impact of the wind turbines is on birds. Birds and bats are susceptible to collisions with the turbines especially during their migrations. Many suffer death and or injury from their accidental interactions with the turbines. (Wild Horse Wind Power Project Final EIS Chapter 3, 2005).

Mitigation Measures for Alternative Action

Plants: Since the habitat type is shrub-steppe and is considered a priority habitat by WDFW, mitigation measures will be completed to reduce the impacts of the project (Wild Horse Wind Power Project Final EIS Chapter 3, 2005). The permanent and temporary impacts on the vegetation will be mitigated according to the guidelines from the WDFW Wind Power Guidelines (WDFW, August 2003) for siting and mitigating wind power projects east of the Cascades. To mitigate for the loss of habitat, there will be an area of shrub-steppe habitat in a different location near the Project site that will be set aside to be protected and managed.

Wildlife: the two main categories of impacts for animals are loss of habitat from the construction and operation of the project and the potential mortality of birds and other species (Wild Horse Wind Power Project Final EIS Chapter 3, 2005). To mitigate the impacts of the turbines on migratory and resident bat and bird species, the use of lower RPM turbines will be implemented as well as the use of bird flight diverters on the towers surrounding the project site. (WDFW 2003).

Energy & Natural Resources for Proposed Action

1. **Amount required/rate of use/efficiency**
    a. *Existing Conditions*

        The District has measured flow for the South Fork Skykomish River and concluded that the mean annual flow (MAF) at Sunset Falls is 2,451 cfs (DLA Exhibit B, 2016). Previous hydroelectric projects were proposed on the Skykomish River as early as 1917, with efforts to explore options for project construction by the District as recently as the 1980's (DLA Exhibit A, 2016).

        Inputs to the South Fork Skykomish River include glacial runoff as well as precipitation during heavy flooding events. Citing studies conducted by the University of Washington, the District suggests that there are significant concerns related to the fluctuation of river flows and snowpack melt as trends predict future warming of the area (DLA Exhibit B, 2016). The diminishing availability of sufficient water sources within the Project area are believed to be long-term effects of global climate change.

    b. *Impacts*

        i. *Impacts of Proposed Action*

            Since runoff patterns are often subject to change, the project will seek to "…take advantage of what is delivered, when it is delivered" (DLA Exhibit B, 2016). The operation of the facilities will seek to maximize output while still complying to maintain an instream flow of

250 cfs. When fully operational, the project will run 24 hours a day as long as instream flows are above these minimum requirements. The maximum diversion allowed under Project operation is 2,500 cfs. When instream flows become higher than 8,000 cfs, the Project will shut-down and cease diversion of water to the intake structure.

The project's maximum capacity for output is 30 MW (megawatts) while average daily output is estimated to be 13.6 MW (DLA Exhibit A, 2016). The amount of energy produced will be capable of annually supplying more than 10,000 homes, which the District states is the "…equivalent to the residential customers of Snohomish, Monroe, Sultan, Index and Gold Bar combined" (District. 2016b). The Project will seek to produce roughly 119 GWh annually under current operational conditions (ie: typical flooding, dry seasons, etc.).

In addition to constructing necessary infrastructure, the proposed powerhouse and transmission lines will require separate power sources. Twin 15-MW Kaplan-type turbine generators are required of the powerhouse while roughly 8.5 miles of 115 kV transmission line will be added to the Gold Bar substation (DLA Exhibit B, 2016). The project boundary includes the Gold Bar section that is outside the jurisdiction of the FERC. A 1,400 ft. power tunnel leading to the powerhouse "…is located entirely within the granodiorite bedrock" that will also provide fiber optic cables and power to the intake, monitor remote systems and fish screens (DLA Exhibit A, 2016).

ii. Impacts of No Action Alternative

The "No Action" alternative will not significantly impact energy uses within the Project area. If the proposed Project is not constructed, energy demand will not be supplemented by local sources and as a result, the District will have to pursue alternate energy plans. These alternative plans will likely be comprised of a mix of nonrenewable and renewable sources.

c. Mitigation Measures

Maintaining instream flows is essential to proper operation of the proposed project. If instream flow is inefficient (when flows fall below 250), the project will shut-down to preserve water quantity. Typical Project shut down will occur between the months of July and October, with operation of the Project only occurring during heavy flood events. These measures will ensure maximum energy generation and will contribute to a decreased local dependence on fossil fuels.

2. Source/availability

a. Existing Conditions

Over the course of roughly two decades (1985 – 2009) the public utility department has registered a 26 percent decrease in summer stream flow for the Snoqualmie – Skykomish watershed along with a 6 percent decrease in spring runoff. The District also notes that winter runoff rates have "increased 10 percent when compared to records for the 1950 to 1985 period" (DLA Exhibit B, 2016). These figures are clearly trending towards lower minimum flows overall in the

summer and increased flows during the winter. Future climate change has the potential to exacerbate these changes even further.

The deep water pool located near the intake structure is not subject to lateral or vertical channel migration. This is due to the presence of deep bedrock outcrops within the Project area. This deep pool resource represents a reliable source for many years to come, even if the Project area experiences fluctuations in snow melt contribution.

b. Impacts

i. Impacts of Proposed Action

The proposed Project will allow for local residents to explore opportunities for long-term renewable energy. The increasing demands for energy are to be supplied by the District through affordable and reliable sources. These demands can be partially met through the construction of the proposed Project, being a clean and naturally occurring energy source. These actions would be concurrent with existing comprehensive planning of Snohomish County. The diversification of energy sources will prove to be a positive aspect of the proposed Project because a wide range of sources are necessary to produce maximum energy output. Supplying roughly 119 GWh annually, the project will operate under conditions that will produce the highest amount of energy possible.

ii. Impacts of No Action Alternative

The District has an obligation to provide local residents with reliable, low-cost energy. Under the "No Action" alternative, the District will have to pursue other renewable and nonrenewable energy projects, most likely at the expense of the tax payer. The elimination of nearly 50,000 tons of carbon into the atmosphere will not be offset if the proposed Project is denied construction rights.

c. Mitigation Measures

Since runoff patterns are often subject to change, the project will seek to "…take advantage of what is delivered, when it is delivered" (DLA Exhibit B, 2016). The diversion of water during Project operation will not significantly affect the availability and quality of these resources. Maintaining instream flows is essential to proper operation of the proposed project. If instream flow is inefficient (when flows fall below 250), the project will shut-down to preserve energy usage. Typical Project shut down between the months of July and October will ensure maximum annual efficiency, with winter operation of the Project only occurring during heavy flood events. These measures will ensure maximum energy generation and will contribute to a decreased local dependence on fossil fuels.

3. Nonrenewable resources

a. Existing Conditions

The project area contains a number of local access roads including to a state highway, SR 2, which the District characterizes as "…a major transportation corridor connecting the Puget Sound urban area with the Cascade Mountain passes to eastern Washington" (SP 14: Traffic Impact Analysis Study Final

Technical Report). Located just north of the South Fork Skykomish River, these roadways are frequently used by motor vehicles for commuting and local access alike. These sources contribute to the degradation of local air quality surrounding the Project area.

b. Impacts

i. Impacts of Proposed Action

If constructed, the proposed project will create 119 GWh of electric energy annually at full capacity and aims to reduce the annual production of approximately 50,000 tons of carbon (District. 2016b). The construction phase of the project will require the use of fossil fuels (such as gasoline and diesel) to power heavy equipment. After completion of the construction phase, project operation will be powered through energy generated. The continued use of fossil fuels during the project's operation do not appear to pose a significant threat to the local community.

ii. Impacts of No Action Alternative

By implementing the "No Action" alternative, the project will not be constructed. This means "…[t]o meet future demands, other energy resources would have to be developed, likely at a higher cost to the consumer, and that may potentially be non-renewable…" (District. 2016b).

c. Mitigation Measures

Being a clean energy project, there are currently no mitigations for the development of nonrenewable resources. The project will provide a positive influence to develop and maintain renewable energy systems near the Project area. Construction of the proposed project will provide the community with reliable, low-cost energy for many years to come.

4. Conservation and renewable resources

a. Existing Conditions

There are currently no renewable energy projects within the Project area. The Project area was chosen due to its proximity to existing transmission lines to provide efficient power sources for Project operation. Previous hydroelectric projects were proposed on the Skykomish River as early as 1917, with efforts to explore options for project construction by the District as recently as the 1980's (DLA Exhibit A, 2016).

b. Impacts

i. Impacts of Proposed Action

Deemed as a renewable resource project, the District "…conducted early consultation with federal (National Marine Fisheries Service [NMFS], U.S. Fish and Wildlife Service, and U.S. Forest Service) and state (Washington Department of Ecology [Ecology] and Washington Department of Fish and Wildlife [WDFW]) resource agencies, the Tulalip Tribes, the Snoqualmie Tribe, and non-governmental organizations" (DLA Exhibit A, 2016). These entities worked with the District to conduct study plans to determine project

effects to water quality and quantity, terrestrial resources/wildlife and aesthetics.

ii. Effects of No Action Alternative

If the proposed project is not constructed, the surrounding area will need to pursue alternative power sources, both renewable and non-renewable. The District claims that the proposed project will reduce the annual production of "approximately 50,000 tons of carbon" (District. 2016b), although alternative project may variably offset this pollution over time.

c. Mitigation Measures

Filed under the Pacific Northwest Electric Power Planning and Conservation Act, the "…program identifies over 40,000 miles of streams in the Pacific Northwest, including the South Fork Skykomish River" (DLA Exhibit A, 2016). The South Fork Skykomish River was chosen as a Project area because of its distinctive hydro-geomorphology and proximity to existing transmission lines. The presence of a naturally occurring deep pool near the intake eliminates the need to for an impoundment method, providing an ideal and persistent source for energy production. Since the proposed energy project is providing energy resources, the District has not directly stated measures to mitigate renewable resource concerns.

Energy and Natural Resources for Alternative Action

Alternate Action - Existing Conditions

The WHWPP currently operates and maintains 149 wind turbines within the alternative Project area. County officials predict a substantial increase in the demand for alternative energy sources, citing information published by the Energy Information Administration that predicts the total electricity demand for the county will grow roughly 1.9% per year from 2001 to 2025 (WHWPPP Final EIS Chapter 1).

The project area was chosen due to its proximity to existing power and transmission lines, "…which have adequate capacity to allow the wind generated power to be integrated into the power grid system" (WHWPPP Final EIS Chapter 1).

Impacts of Alternative Action

The WHWPP is a Kittitas County renewable energy project that has the potential to deliver a capacity of up to 30 (MW) to and will "…provide low cost renewable electric energy to meet the growing needs of the Northwest" (WHWPP Final EIS Chapter 1). Going forward, pursuing alternative energy sources for the citizens of Washington State is a goal that is consistent with state comprehensive plans.

The WHWPP has the capacity to help fulfill these needs if the proposed project were to be constructed, generating enough energy to supply 7,300 homes. These figures are based off of calculations of previous Project plans. The maximum capacity of operation will occur during wind speeds of 31 mph, with project shut-down occurring when wind speed falls below 9 mph or raise above 56 mph. The average operational rate will occur when wind speed is approximately 17 mph.

Alternative Action Mitigation

The construction of electrical power lines is necessary for operation of the facility. This wiring will be moved underground when possible to eliminate aesthetic

alteration of the natural landscape. Other than these mitigations, there are currently no additional guidelines to preserve natural energy sources.

Environmental Health for Proposed Action

1. **Noise**
   a. *Existing Conditions:*

   There are several rural homes near the construction site where blasting will occur. There are also several species sensitive to noise that live in the Project area (District. 2016b). Existing noise conditions were studied (District. 2014c Noise) by measuring ambient sound. At the proposed site of the powerhouse the range of noise level was 65-68 decibels using an A-weighted scale (dBA) during Spring and 55-58 dBA in Fall and a maximum of 81 dBA over all seasons. At the intake site, the range in sound was 53-62 dBA with a maximum of 86 dBA. Included in these ranges is the noise from U.S. 2 which measures at around 65 dBA (District. 2014c Noise). No other sites were measured.

   b. *Impacts*
      i. *Impacts for Proposed Action*:

      Traffic and Tool Operation: There will be variance in noise impact from the different construction phases. Phase 1 of construction will be the loudest and includes blasting and most of the above ground excavation. Residences near the fish screen and intake are expected to experience noise elevations of approximately 15 dBA. During Phase 2 most of the work will be done below ground, but those residing around the fish screen and intake are expected to have potential noise increases of 10 dBA, mostly from ground-level equipment. Phase 3 of construction involves short duration finishing work at the fish screen site and some tunneling at the intake site that would result in potential noise increases of 10 dBA.

      Blasting: The powerhouse and intake site are about a quarter mile from the nearest edge of the North Stand. The North Stand is a 31.6-acre patch of habitat located just north of U.S. 2. At that distance the sound of the blasting would not exceed 61.1 dBA and would be quieter than nearby highway traffic on US 2. Blasting at the powerhouse would cause noise levels of 90 dBA. This would be attenuated by regular blasting measures in which actions are taken to ensure the majority of force is put downward into the rock instead of up into the air (District. 2014c Noise. 5.1.3). Blasting is not expected to affect the bald eagles and ospreys that forage in that vicinity. Blasting noise is not expected to be a significant impact (District. 2016b).

      Operation: Once the Project is completed, normal operation will not increase sound levels over those currently in existence (District. 2016b). After construction, the Project would contribute no carbon dioxide or methane. By using this hydropower project instead of burning fossil fuels for energy, approximately 50,000 tons of carbon dioxide will be saved each year. (District. 2016b)

      ii. *Impacts of No Action Alternative*

The impact to noise would not significantly adversely affect the surrounding environment.

c. Mitigation Measures

A blasting plan will be implemented to reduce the noise to nearby homes. Blasting noise would be attenuated by standard blasting measures that would be included in the blasting plan, in which actions are taken to ensure the majority of force is put downward into the rock instead of up into the air (District. 2014c Noise. 5.1.3). Heavy equipment during construction will contribute to increased noise level. Maintenance of mufflers and turning off idle machinery could help reduce noise impacts. Substitution of tools for quieter and equally efficient will be implemented when possible, for example using hydraulic or electric impact tools instead of gas-powered jack hammers, rock drills, and pavement breakers. Installation of noise barriers will occur as needed around residences close to construction sites. Equipment back-up noises will also be efficiently regulated and reduced (District. 2016b).

2. Risk of Explosion

a. Existing Conditions:

There is no significant risk of explosion or chemical spill at the Trap and Haul facility located at Sunset Falls.

b. Impacts

i. Impacts of Proposed Action

Bedrock will be blasted to enable excavation of parent material in order to construct hydroelectric facilities. There is no significant risk of explosion associated with other aspects of the Proposed Project. In the construction phase, vehicles and tools will require several different kinds of fuels and lubricants that may pose a threat to environmental health if spilled into the water way. The contractor may also make the decision to store some of these chemicals at the construction site. A spill of these fuels and liquids containing hydrocarbons could potentially affect all freshwater organisms including algae, mammals, birds and invertebrates (District. 2016b). There is also potential for a secondary impact to species because of the cascading effects of the food chain. If a lower trophic level species, such as algae or invertebrates, is adversely affected from a spill, their natural predators may also be adversely affected through direct ingestion of the food species or mortality from limited food species. While in the operational phase, there should be no threat to environmental health from risk of spills.

c. Mitigation Measures

In order to mitigate hazard risks associated with blasting of bedrock certain procedures will be followed during construction. The contractor performing the blasting work will be required to retain a blasting consultant to review the blast designs and resulting blasts. Micro-second delays will be required

during each blasting round. This will limit the magnitude of vibration during blasting and minimize threat of slope failure. Additionally, the timing of blasting will be taken into consideration to avoid landslide threat, i.e. blasting will not occur if soils are saturated (District. 2014a Geotechnical). Blasting was not found to have significant impacts to the fish and wildlife. Required for the Proposed Project is an Erosion and Sediment Control Plan. In this plan, outlines for how to react to a chemical spill and techniques for proper storage and disposal of hazardous materials will be outlined (District. 2016b).

Land & Shoreline Use for Proposed Action

1. **Relationship to existing land use plans and to estimated population**
   a. *Existing Conditions*

The land ownership surrounding the South Fork Skykomish River encompasses a wide mix of ownership types, including federal, state, county, and private as well as lands owned by the District (Terrestrial Resources Management Plan). The majority of the lands that lie within the Project vicinity are owned by the State of Washington as well as the federal government. The United States Forest Service (USFS) administers and monitors public lands within the Project vicinity (District. 2016b). Private lands include local residences, the Burlington Northern Santa Fe Railway (BNSF) and land used for commercial timber production. In fact, The District has conducted studies that found that either timber extraction and forest recreation are roughly 74 percent of the current land use (District. 2016b). Extensive logging on the base of the Cascade Mountains occurred up until the 1930's as the United States economy battled the effects of the Great Depression.

There are also a number of peaks within the project vicinity, including Mount Baring, Persis, Index and Philadelphia Mountain (SP 9: Aesthetic Resource Study Final Technical Report). The District has shown that wetland and riparian habitat is present within the Project area, encompassing approximately "300 feet around proposed Project facilities, 100 feet along access roads, 200 feet along the transmission line, and 300 feet along the bypass reach" Shoreline in the Project area includes riparian habitat that is "…is limited by steep banks and bedrock outcrops" (District. 2016b).

   b. *Impacts*
      i. *Impacts for Proposed Action*

Although there are a mixture of land ownerships occurs within the project vicinity, the District claims that the currently proposed powerhouse will be permanently placed on "land that is owned by the WDFW adjacent to the existing Trap-and-Haul Facility" (District. 2016b). Transmission lines, however, must extend beyond ownership of the WDFW into the Town of Gold Bar (District. 2016b). The District is actively pursuing the diversification of land use in the area, stating that expanding construction of a powerhouse next to the Trap-and-Haul

facility "makes the overall development in the area more prominent" (SP 9: Aesthetic Resource Study Final Technical Report). Developing proper renewable energy infrastructure will likely lead to the further expansion of new, similar hydro projects surrounding the Project area.

Riparian habitat will not be harmed by the construction of the powerhouse facility or the project intake even though construction is necessary within the "South Fork Skykomish River stream buffer" (District. 2016b).

ii) Impacts of No Action Alternative

Under the No Action alternative, land uses within the Project area will not be negatively or positively impacted. The diversity of land uses within the Project area will continue to exist and poses requires no immediate actions.

c. Mitigation Measures

The Terrestrial Resources Management Plan (TRMP) will provide services that will assist in the managing, maintenance and monitoring of habitat conditions within Project area and will produce "a schedule for implementation, plan updates, and reporting" (District. 2016b). This includes riparian and wetland areas within the project boundary. Noxious weeds within the project boundary will be removed with revegetation and restoration occurring after construction ceases. Revegetation of the project area will arguably improve potential habitat for bald eagles and osprey, also be monitored under the TRMP.

2. Housing

a. Existing Conditions

Land uses within the project vicinity vary greatly, providing a diversity of "industrial, commercial, government and residential structures" (SP 9: Aesthetic Resource Study Final Technical Report). There are a number of houses within the project area that are used year-round. Other homes are rented seasonally and "used occasionally for camping or river recreation, or rarely visited by their owners" (Terrestrial Resources Management Plan). Homes are present on both sides of the river along the shorelines. While public access to the South Fork Skykomish River is currently restricted, a study found that several suitable locations around the project area were available for public development, but "private landowners and the community homeowners association were reluctant" to consider this a possibility (District. 2016b). The residential communities near the project area were developed in the 1950s and do not comply with previous state platting laws (District. 2016b).

Permanent urban communities are located near the project area, including "Index, Gold Bar, Sultan, Monroe, Snohomish, Marysville, and Everett" (District. 2016b). Index, located approximately one-mile north of the project area, has an estimated population of approximately 194 (United States Census Bureau, 2015). The city of Everett, representing the largest urban center near the proposed

Project, is approximately 38 miles east of the proposed Project area (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

The proposed Project will have moderate negative effects on private residences. These impacts will not be long-term due to the temporary nature of construction. Increased noise and lighting from construction activities will likely disrupt current conditions for local homeowners, however, negative effects during Project operation do not appear to be significant since private property owners will have continued private access within their respective properties. Traffic in the area will become slower and more stagnate during the construction phase of the Project. Similar to noise, the negative effects to traffic flows will be eliminated at the conclusion of construction activities. The proposed Project will not include temporary housing for construction workers and for this reason does not pose a significant negative threat.

ii. Impacts of No Action Alternative

Under the "No Action" alternative, housing near the project area will not be significantly affected. Without Project construction, temporary noise and lighting concerns are eliminated and current conditions will be able to persist without impediment.

c. Mitigation Measures

Construction activities will seek to minimize noisy activities near adjacent rural homes, such as blasting of solid granodiorite (District. 2016b). This measure will also minimize the risk of landslides and mass wasting to protect these residences. During Project operation, lighting will be reduced to only illuminate necessary Project facilities, such as the proposed powerhouse.

3. Lights and Glare

a. Existing Conditions

The current Trap-and-Haul facility has lighting structures in place to illuminate the elements necessary for operation. Other than this resource, there is little to no illumination within the project boundary other than distant lighting from nearby residences. Since there are no designated recreation opportunities for the public around the Sunset Falls area, there is little need for high illumination of the project area as it currently exists.

b. Impacts

i. Impacts of Proposed Action

Exterior lighting fixtures are necessary during the construction phase of the project. These impacts prove to be purely aesthetic and will be mitigated once construction of the necessary facilities ceases. After removing the exterior lighting fixtures, permanent fixtures will be placed on the Trap-and-Haul facility, powerhouse and switchyard.

ii. Impacts of No Action Alternative

Under the "No Action" option, the proposed project will not expand lighting and glare in the Sunset Falls area will remain unchanged. Recreational users will continue to seek enjoyment from aesthetic and water resources. By not updating the Trap-and-Haul facility, current levels of light will persist when necessary during operational hours.

c. Mitigation Measures

Lighting of the project facilities will only be operational when necessary, with many of the fixtures operating to be "time phased". These fixtures will be mounted on materials such "wooden or prefabricated metal structures", preferably being made of materials that are non-reflective (SP 9: Aesthetic Resource Study Final Technical Report). Shielding lights and proper mounting angle will be utilized when possible, including the use of semi-buried configurations. Co-locating the proposed powerhouse near the existing Trap-and-Haul facility will minimize the need for extensive lighting structures.

4. Aesthetics

a. Existing Conditions

The South Fork Skykomish River is heralded as one of the best local recreation and hiking destinations in the area. Although there are no designated public access points to the river, locals frequently take part in kayaking and fishing, among other outdoor hobbies. The Nationwide Rivers Inventory (NRI) has noted that the river has a unique aesthetic, with features that include "exceptional boulder and floodway zones" as well as "clear water with rapids" (SP13: Recreation Opportunities and Access Study Final Technical Report). Locals feel very strongly about the preservation of the aesthetic resources.

In a survey commissioned by the District, results showed that most of the people who visited Sunset and Canyon Falls most recently did so to view the falls as a part of sightseeing (SP13: Recreation Opportunities and Access Study Final Technical Report). This survey also found that the majority of survey participants visited the falls area "… more than once but infrequently". This implies that although recreation is not an intended use of the area, it still proves to be a significant factor in shaping the attitudes of local residents.

b. Impacts

i. Impacts of Proposed Action

Since a majority of local users admire the falls and the accompanying water sources, project operation will allow for "aesthetically appealing" flows to continue. Due to a high prevalence of private lands surrounding the areas around Canyon and Sunset Falls, non-residents will not experience a reduction in access opportunities on days of "aesthetically appealing flows" (SP 9: Aesthetic Resource Study Final Technical Report).

During the construction phase, aesthetics within the Project area will experience significant negative impact due to the presence of heavy machinery and equipment. The construction of concrete and new impervious surfaces will likely appear visually dissimilar to nearby aesthetics even after the construction phase of the Project.

c. Mitigation Measures

Extensive studies by the District have been conducted to review possible alterations to nearby aesthetics. These findings (which the District firmly stand behind) have been questioned by FERC officials as well as locals during comment periods. The requirements of these studies included photos and videos of key observation points (KOP's) at different river flow levels and were displayed to focus groups and ranked by "Scenic Integrity". Ranging from "High" to "Very Low", participants classified each image or video according to their personal beliefs. The specifications of these studies (ie: number of participants, quality of photography/video, accuracy of modeling, etc.) have shown to satisfy the basic requirements needed for approval.

The District has also agreed to construct structures that are similar in color and texture to nearby features, blending with existing landscapes when possible. This includes the construction of adjacent access roads within the project area, with road cuts following "existing topography as much as possible" (SP 9: Aesthetic Resource Study Final Technical Report). Preference for "visually unobtrusive" and practical design, including non-reflective materials (SP 9: Aesthetic Resource Study Final Technical Report). Screening facilities by planting native plants serves as a mitigation for both aesthetic and landscape continuity.

5. Recreation

a. Existing Conditions

Year-round recreation is available around the Canyon and Sunset falls area, with activities that include "whitewater boating (including rafting, kayaking, and canoeing), inner tubing, swimming, fishing, running, biking, scenic driving, and hiking in the Mt. Baker-Snoqualmie National Forest" (Technical Report Addendum: Recreation Opportunities and Access Study). As a result, locals are very much interested in nearby outdoor recreation due to the incredible scenery that the river provides people, although public access is restricted in most areas. Rafting classes range anywhere from Class II (beginner) to Class V (expert; over 5,000 cfs) that allow new-comers and veterans alike to participate. Both the North and South Forks of the Skykomish River are incredibly popular for fishing Pink, Chum, Coho, and Chinook salmon (District. 2016b). Hiking trails are available for year round use and are primarily in the spring and fall.

The public has expressed interest in expanding the trail system within the nearby recreation area. In fact, the USFS has stated that "…the parking lot is often overflowing during the busy summer months" (SP13: Recreation Opportunities and Access Study Final Technical Report), suggesting seasonal variation in crowd

sizes. Exactly half of interviewed users of recreation opportunities stated that they were "in favor of additional recreation access" to the South Fork Skykomish River recreation area, while 35 percent stated they were "not in favor of allowing public recreation access" (SP13: Recreation Opportunities and Access Study Final Technical Report).

There are not any designated public access opportunities within the project area, which prohibits recreation access within Project area, including Sunset and Canyon Falls. No trespassing signs frequently used throughout the Project area (Revised Study Plan).

b. Impacts

i. Impacts of Proposed Action

According to The District, developing the proposed Project will significantly impact current and future recreation opportunities within the South Fork Skykomish River corridor. According to the District, the Project will "have direct, and indirect effects on current and future recreation use of the Project area" but will not negatively affect public recreation near Sunset and Canyon Falls (Revised Study Plan). This is due to the fact that there are currently no designated public access points within the Project area (District. 2016b).

ii. Impacts of No Action Alternative

The "No Action" alternative will not cause significant impact to recreation opportunities near the South Fork Skykomish River. Since there are currently no designated public access points within the Project area, public recreation opportunities will be neither improved nor degraded under this scenario.

c. Mitigation Measures

The District has conducted numerous studies to gauge public interest in recreation. By coordinating with Heybrook Ridge County Park staff members, there are efforts to install and expand important signage for hikers and recreation surrounding the project area. There are many popular hiking trails maintained by the Heybrook Ridge team, including a particular lookout trail that is approximately one mile from the location of the Project powerhouse (District. 2016b). These opportunities will also provide educational information about the hydroelectricity that the project provides to the community, with the District proposing "…a kiosk with interpretation and educational signage about hydroelectric power, the Project, the Trap-and-Haul Facility, surrounding environmental resources, and other topics of interest" (District. 2016b).

6. Historic and cultural preservation

a. Existing Conditions

Within the project area lies a number of historic properties, however there are no lands (as The District claims) that the National Registry of Historic Places (NHRP) recognizes as having "…archaeological resources or traditional cultural properties" (Revised Study Plan). There are three bridges as well as one single-

family residence that are It is believed that the remaining 42 structures do not qualify for inclusion into the NRHP because they are "…unlikely to provide additional information important to our understanding of local or regional history… because they either lack architectural integrity and/or historic association to important people or events. (SP10: Historic Properties Study Final Technical Report – Public Version).

A study conducted by the District has concluded that nearby a historic Native American site was located approximately one mile from Sunset Falls, near Index, WA. This area has been recognized as being "culturally modified" and this "…indicates contemporary use of this portion of the Skykomish River for customary practices" (SP10: Historic Properties Study Final Technical Report – Public Version).

b. Impacts

i. Impacts of Proposed Action

During the project proposal process, the District met with the Tulalip, Snoqualmie and Stillaguamish Tribes to discuss impacts to culturally significant areas. During a meeting in February 2015, the Tulalip Tribes "…noted that burials have taken place in the general area, but are not known to occur in the Project Area… To date, the tribes have not disclosed any traditional cultural properties (TCPs) to the District…" (District. 2016b). Recommending caution, the tribes included a preference for monitoring cultural resources during the construction of the proposed project facilities.

ii. Impacts of No Action Alternative

Under the "No Action" scenario, historic and cultural preservation will not be significantly affected. The District has coordinated with the Tulalip, Snoqualmie and Stillaguamish Tribes to ensure that the Project area does not contain any historic or sacred sites. After consultation, the District is highly confident that there are no such instances within the Project area. The discovery of historical sites within the project area does pose significant positive or negative impact for these reasons.

c. Mitigation Measures

The District has agreed to extensively monitor historic preservation in accordance with various other organizations (ie: Tulalip Tribes, FERC, AMEC, etc.). The project also will include the implementation of the Snohomish County Unanticipated Discovery Plan (UDP) to establish procedures to avoid potentially negative effects to historic resources during Project operation. Procedures include maintenance activities, preservation of habitat and the elimination of noxious weeds (District. 2016b). Coordinating with tribes such as the Snoqualmie and the Tulip will provide aspects of cultural sensitivity to preserve and protect important sites.

7. Agricultural crops

a. Existing Conditions

There is currently no documentation of agricultural land uses within the Project area. The dominant land uses within the Project vicinity are productive timber harvest and private property ownership.

b. Impacts

i. Impacts of Proposed Action

There are no stated or obvious impacts that will negatively affect agricultural uses within the project area. Water quality and availability might be altered during construction and operation of the facility, but these impacts will not significantly or directly affect sources for agricultural production.

ii. Impacts of No Action Alternative

The "No Action" option will not significantly affect agricultural production in Snohomish County. Sunset Falls is a significant recreation destination for locals and has little to no association with agricultural uses in the area.

c. Mitigation Measures

There are currently no mitigation measures in place to preserve agricultural uses within the project boundary because no negative effects are believed to impact these areas. If there are any contaminants to water sources as a result of construction, the District has pledged to mitigate downstream mitigation of the Skykomish River.

Land and Shoreline Use for Alternative Action

Existing Conditions of Alternative Action

The current land use operates 149 wind turbines over 10,000 acres of land. The surrounding landscape is mainly comprised of open space and rolling hills. PSE is currently in charge of managing and distributing wind and solar allocations.

Impacts of Alternative Action

Zoning of Kittitas authorizes the county to purse wind energy under the "Forest and Range" and "Commercial Agriculture" zones (Wild Horse Wind Power Project Chapter 3), concurrent with comprehensive plans. This area does not meet the criteria for prime farmland and minor clearing of rangelands will not have a significant negative impact on grazing or farming within the project area. The construction of an additional 18 turbines does not have significant negative impact on land uses because new structures will be concurrent with current land uses.

Alternative Action Mitigation

Mitigation of aesthetic concerns of the project should include uniform design of project structures, moving electrical systems underground, minimizing new asphalt and

fewer lighting apparatuses. In addition, strategic placement of new structures will minimize the aesthetic impact to local residents and commuters. The construction of electrical power lines is necessary for operation of the facility. This wiring will be moved underground when possible to eliminate aesthetic alteration of the natural landscape.

Transportation for Proposed Action

1. **Traffic**
    a. *Existing Conditions*

The largest major highway near the project area is U.S. 2, a two-lane road which falls just north of the area. Other existing roads in the more immediate vicinity of the project area are 217th Place SE, South Riverside Road, and Mt Index River Road. A traffic study conducted for the area found that the current traffic level rating for both U.S. 2 and the other access road intersections is a Level of Service C. Level of Service (LOS) refers to the qualitative measure of traffic service for a road. A LOS C dictates that the traffic on the road is near free flow, but ability to maneuver between lanes is restricted. The posted speed limit of the road can still be maintained, but if an incident where to occur, traffic delays may occur. This is the common target for most rural highways. The traffic study found that the daily traffic rate on the stretches of Highway 2 around the project are between 8,000 and 10,000 vehicles per day. The speed limit on Highway 2 is posted at 60 mph, and 10-20 mph on Mt Index River Rd and 217th Place SE (District. 2016b).

    b. *Impacts*
        i. *Impacts of Proposed Action*

The most significant effect on traffic will likely occur during the initial three-month construction phase, dependent upon where the soil from the excavation of the site is dumped. A traffic study estimated that during this phase, if off-site disposal is required up to 15 round trips per hour could occur, at peak construction times (mid-day). Figure (x) describes peak volumes throughout the day if soil has to be dumped off-site or if it can be removed on-site. the Proposed Action has no plans to expand on or eliminate any parking spaces (District. 2016b).

A LOS rating of a C will occur on U.S. 2 during the construction period. Other existing roads in the more immediate vicinity of the project including 217th Pl SE, S Riverside Rd, and Mt Index River Rd will be impacted from construction in the area for three months. The traffic study noted that these intersections will continue to operate at LOS C as usual (District. 2016b).

Three new small gravel access roads will be built, including an upgrade to one going to the trap and haul facility, one to the intake, and one to the perimeter of the fish screens. The project will undertake improvements to roads based on discussion and permission from necessary authorities. Because of the size and number of construction vehicles, roadways may require some enhancements including improving all weather surfacing and elevating the roadway in order to avoid flooding, and widening other existing roads. These impacts may not be significant

because they will be improving road quality, and are occurring on existing roads (District. 2016b).

ii. Impacts of No Action Alternative

If no action is taken, roads will continue to operate at their current LOS, a C. No new roads will be built. No existing roads will need to be upgraded to handle the construction crew traffic. Traffic conditions will exist as they are currently.

c. Mitigation Measures

In order to mitigate impacts from the proposal, flagger and extra police enforcement will be used enhance the flow of traffic. Extra police enforcement will be used on U.S. 2 going from the potential excavation dump site at Cadman Quarry (Mile 36.6) to directly north of the Powerhouse site (Mile 31.6) (District. 2014d. Traffic). Appropriate signage will also be posted to reduce speeds in the construction area. Objects that impede vision when turning onto or off Highway 2 onto the access roads will be removed for safety. Roads will be improved as needed in order to accommodate the weight of the construction vehicles (District. 2016b).

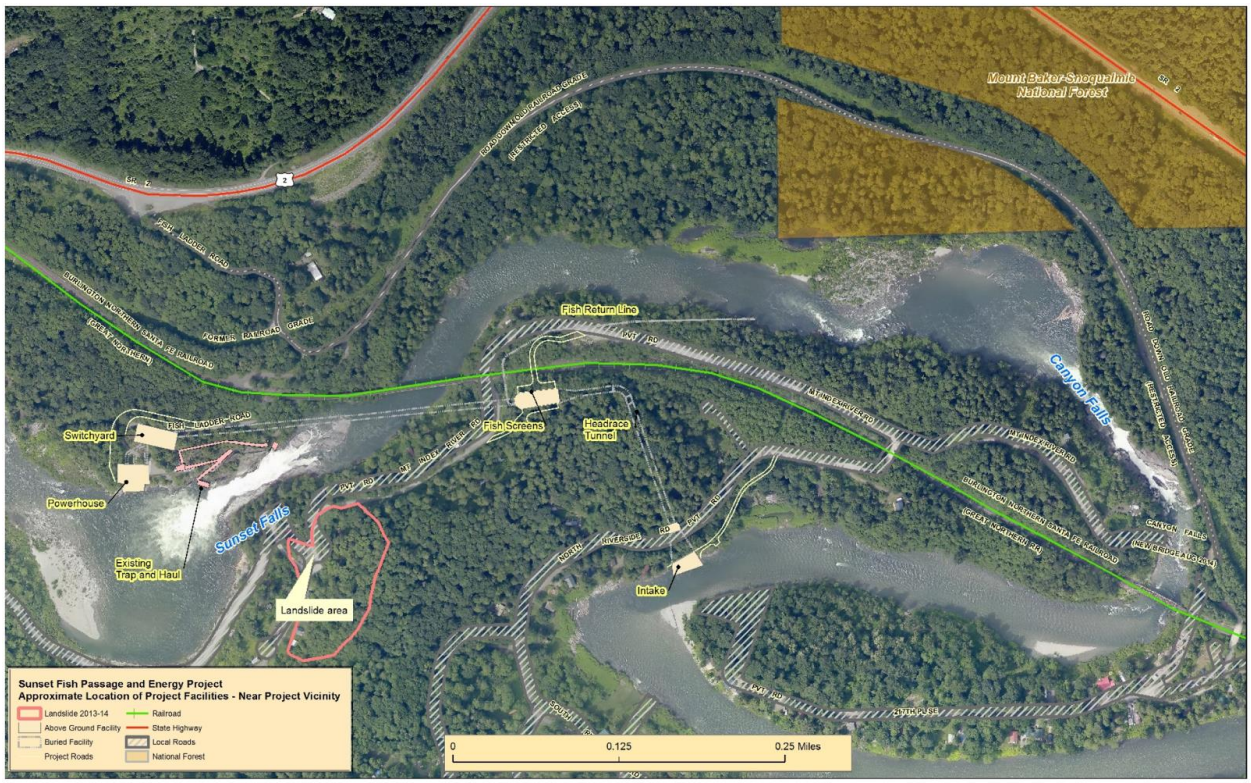


Figure 6: Existing and proposed roads that fall within the Proposed Project vicinity. Proposed roads (pale yellow) will be made of gravel.

2. Public Transportation

a. Existing Conditions

This site is not currently served by public transit, as the surrounding area is fairly rural. The closest bus stop is 9.5 miles away at 10th and Orchard in Gold

Bar, WA. The bus system is run by Community Transit, with the hub located in Everett, and the stop in Gold Bar being serviced by Routes 270/271.

b. Impacts

i. Impacts of Proposed Action

The project will not occur near existing water, rail or air transportation (District. 2016b). The number of people operating the facilities when in service will not warrant a need for a new bus route to accommodate their commute.

ii. Impacts of No Action Alternative

No Action will not require any additional public transportation.

c. Mitigation Measures

No mitigation measures will be needed in terms of public transportation, because no existing routes travel as far East as the proposal area.

Transportation for Alternative Action

Existing Conditions

The proposed project would be accessed through an existing private gravel road, Beacon Ridge Road, which branches from Vantage Highway. There is an existing network of crisscrossed access roads closer to the project area as well.

Impacts for Alternative Action

During the most likely scenario for the alternative project, there are several impacts that would occur to traffic and public transportation. Approximately 812 daily trips would need to be done with an off-site rock quarry, during the construction phase. 2 acres of parking would be required for construction crews. There is also some risk with current roadway systems being able to handle the weight of fully loaded construction vehicles and transportation of fuels to run equipment. Once the construction phase is over, the project would still require approximately 30 parking spaces and 36 daily trips for operation and maintenance. Up to 15 miles of road would have to be improved, and 17 miles of new road constructed. Where available, these new roads would be gravel roads to allow for proper drainage.

Alternative Action Mitigation

Similar to the mitigation measures taken for the Sunset Hydro project, appropriate signage and flaggers will be used to help the flow of traffic in the area. It is also noted that the applicant for the project will encourage carpooling among construction workers. If the pavement becomes degraded due to the flow of heavy construction vehicles, the applicant will restore the pavement to a quality equal to or better than it had been before.

Public Services and Utilities for Proposed Action

1. Fire

a. Existing Conditions

Snohomish County has 28 fire districts. The Project is in fire district 28.

(Snohomish County Fire Districts, 2017) The nearest station is Station 55 in Index, Washington. This station has five response vehicles, made up of an aid vehicle, a brush fire vehicle, a rescue vehicle, a fire engine, and a utility vehicle (Snohomish County Fire District 28, 2017). Approximate distance to the site according to google maps 3.8 miles with an 11-minute travel time, however emergency response vehicles typically go faster than the posted speed limit (Google Maps, 2017).

b. Impacts

i. Impacts of Proposed Action

Safety measures will be put in place to ensure safe handling of flammable materials onsite such as motor oils, lubricants, or fuels (District. 2016b). There is also a risk of fire from explosion because of the use of explosives during the blasting period of the project (District. 2016b).

ii. Impacts of No Action Alternative

No Action will not require any additional fire services because no additional fire risks are added.

c. Mitigation Measures

With use of the blasting plan and the safe handling of flammable materials the risk of fire is not significant. There was no need to create a contract for service with the nearby fire station because of the low risk of fire (District. 2016b).

2. Police

a. Existing Conditions

The Project area is served by the East Precinct of the Snohomish County Sheriff's Department. The proposed powerhouse is located directly next to the trap-and-haul facility, which is located on state-owned private land. This was not made accessible to public because of concerns of vandalism and break-ins (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

During construction, additional police enforcement will be added to surrounding main roads and State Route Two in order to reduce speed. This increase in police will be minimal and temporary. The land the powerhouse will be located is private so police are not expected to be needed often to address vandalism or break-ins (District. 2016b).

ii. Impacts for No Action Alternative

No Action will not require any additional police services because the current trap-and-haul facility is located on private land and is at low risk for vandalism or break-ins.

c. *Mitigation Measures for Project Action*

There are no mitigation measures for Police Services because the additional construction will not change the potential for break-ins or vandalism.

3. Schools

a. Existing Conditions

The closest school is in Index, Washington and it is within the project area (Google Maps, School, 2017).

b. Impacts

i. Impacts for Proposed Action

The project will not require any additional school services so it will not adversely impact schools.

ii. Impacts of No Action Alternative

No Action will not require any additional school service so it will not adversely impact schools.

c. Mitigation Measures

There are no mitigation measures occurring for schools because schools are not affected by the project.

4. Parks and other recreational facilities

a. Existing Conditions

There are several parks and recreational areas in the project area and the surroundings. These will include Heybrook Ridge County Park about a mile from the project area when it is completed. The land was acquired in 2009 and will include public facilities such as trails. Two other visitor destinations, Bridal Veil Falls and Lake Serene are also 1 mile from the proposed powerhouse. Heybrook Lookout Tower trail has a limited view of the bypass reach for the proposed project and offers no views of Canyon Falls or Sunset Falls (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

The Proposed Project is unlikely to affect Heybrook Ridge County Park significantly. Parks in surrounding area may be affected by noise, air quality/smell, and some construction material during the construction period. Affects will be temporary and non-significant (District. 2016b).

ii. Impacts of No Action Alternative

If no action is taken then the parks will not be affected by noise, smell, or aesthetic disruptions during construction.

c. Mitigation Measures

No mitigation measures are not needed because effects on parks are temporary and non-significant.

5. Maintenance

a. Existing Conditions

The Trap-and-Haul facility undergoes occasional maintenance.

b. Impacts

i. Impacts for Proposed Action

For maintenance, several potentially hazardous fluids will be kept on site including diesel and gasoline, motor oil, hydraulic fluid, and other lubricants. Inspection and maintenance of erosion and sediment control structures occurs in order to comply with best management practice. Other maintenance is not likely to disturb wildlife because

noise and activity levels will not be greater than those caused by residential development, traffic on local access roads and the railroad, and the existing Trap-and-Haul operations. The access road to the Trap-and-Haul facility will be improved and maintenance will be easier in the future. The fish screen will be self-cleaning and will not require maintenance often (District. 2016b).

ii. Impacts of No Action Alternative

No impacts would occur because maintenance would continue as usual.

c. *Mitigation Measures*

Safety measures to contain maintenance materials or hazardous fluids will occur. During road maintenance, the same safety considerations will be taken into account as during construction.

6. Communications/Utilities

a. Existing Conditions

The internet and phone service provider for the project area is Frontier Communications (Frontier, 2017).

b. Impacts

i. Impacts for Proposed Action

The Proposed Action will not impact internet or phone service in the area.

ii. Impacts for No Action Alternative

No changes would be made to communication or utilities.

c. Mitigation Measures for Project Action

No mitigation measures are necessary because the project will not significantly impact communications or utilities.

7. Water/stormwater

a. Existing Conditions

There is a blasted bedrock gravel parking lot at the trap-and-haul facility that is impermeable. The trap-and-haul facility is made of concrete and other impermeable surfaces as well. There are several houses in the area with driveways that make up more impermeable surfaces. The Project area is made up of areas of vegetation and rock.

b. Impacts

i. Impacts for Proposed Action

Several new crushed rock roads will be built in order to transport materials to and from the Project site. There will be the addition of the powerhouse and switchyard, which will be constructed using impermeable materials. No additional parking lot will be constructed for the powerhouse.

ii. Impacts for No Action Alternative

If no action is taken then water and stormwater conditions will remain the same because no additional impermeable surface will be added.

c. *Mitigation Measures*

The developers will manage runoff and stormwater through established PM&Es. These include erosion control measures such as placement of rock riprap and vegetation to cover exposed surfaces, establish perimeter controls with sediment barriers and stabilization of exposed soils. The Project will comply with Washington Department of Ecology Stormwater Management Manual for Western Washington (District. 2016b).

8. Sewer/solid waste

a. Existing Conditions

A portable trailer serves as seasonal staff housing and office space when the trap-and-haul facility is operating. There is a toilet in the trailer. There is no other information regarding existing sewer or solid waste conditions (District. 2016b).

b. Impacts

i. Impacts for Proposed Action

Construction activities will produce solid waste in the form of garbage/trash, construction debris, and human waste. The project will not significantly impact sewer/solid waste (District. 2016b).

ii. Impacts for No Action Alternative

If no action is taken then there would be no effect on sewer/solid waste because it would not be increasing or changing.

c. Mitigation Measures for Project Action

Mitigation measures include plan of collection for all garbage/trash, construction debris, and human waste (District. 2016b).

Public Services and Utilities for Alternative Action

Existing Conditions

The Alternative Project site is zoned as Commercial Agriculture and Forest and Range and does not require many public utilities. Fire District #2 serves the area (Wild Horse Wind Power Project Final EIS Chapter 2, 2005). The Project area has undergone a communication study and it was found that microwaves and fresnel waves are present.

Impacts of Alternative Action

Necessary electrical and communication cables for the project would be buried anywhere from 1.5-4 feet in trenches alongside the row of turbines. An Operations and Maintenance facility will be constructed along with a parking lot for the facility in order to maintain and monitor the transmission lines, substations, and turbines (Wild Horse Wind Power Project Final EIS Chapter 2, 2005). Maintenance of Project will also include tailpipe emissions and some fugitive dust but these are negligible. WHWPP's EIS states in Chapter 1 that most public services and utilities will not be significantly impacted with the exception of law enforcement, fire protection, and communication systems (2005). Communication will not be disturbed by the project.

Alternative Action Mitigation

As stated in Chapter 2 of WHWPP's EIS, the cost of mitigation will come from tax revenues generated by the Project (2005). Trenches would then be back filled and restored to previous grade and an appropriate seed mix would be dispersed on top. There are several mitigations for stormwater including pollution prevention, preventative and corrective maintenance, and general good housekeeping. The Applicant has a contract with Fire District #2 for protection services throughout the Project's lifetime. No other mitigation is deemed necessary (Wild Horse Wind Power Project Final EIS Chapter 2, 2005).

Conclusion and Recommended Action

Of the three evaluated actions, (the Proposed Action, the Alternative Action, and the No Action Alternative) the No Action Alternative caused the least significant adverse environmental impacts. Under the No Action Alternative, the only adverse environmental impact was the Trap-and-Haul Fish Facility located at the base of Sunset Falls would not be upgraded. Upgrades to the Trap-and-Haul Fish Facility rely on funds generated by the Snohomish PUD and subsequent hydro project. The No Action Alternative also fails to address the growth in energy demand expected within the Snohomish PUD's service region. The PUD is expected to have an increase in energy demand of 25% over the next 15 years. The No Action Alternative was rejected because these future energy demands must be met.

The Alternative Action was rejected because it did not result in fewer adverse environmental impacts, and would lead to increases in energy expenses for the Snohomish PUD's service region. The Alternative Action was selected because it satisfied the Climate Change Policy passed by the Snohomish PUD in 2007. An expansion of 18 V80 1.8 MW wind turbines to the existing wind facility would satisfy the Climate Change Policy by meeting future energy demands through a diverse mix of renewable resources. Wild Horse Wind and Solar Facility is owned by PSE. Under the Alternative Action the Snohomish PUD would buy energy from PSE. This would lead to increases in energy costs for the residents serviced by Snohomish PUD. The Alternative Action would also require cooperation from PSE, which is not guaranteed. The energy source would not be local. The PUD would not own the energy and would be subject to volatile short term energy markets at the whims of PSE. Additionally, the Decision Matrix shows greater significant adverse environmental impacts under the Alternative Action.

The contributors to this EIA recommend the Snohomish PUD be granted the appropriate licenses to implement the Sunset Fish Passage and Energy Project. With the proposed mitigation measures the adverse environmental impacts would mainly be temporary and occur during the five-year construction period. The permeant adverse environmental impacts would be sufficiently off-set by the upgrades to the Trap-and-Haul Fish Facility. Upgrades to the Trap-and-Haul Fish Facility would improve fish populations in the area. Under the currently proposed mitigation measures the Snohomish PUD is required to maintain a minimum flow of 250 cfs in the South Fork of the Skykomish River near the Project area. In addition to the current mitigation measures proposed by the PUD, it is suggested that a minimum of 400 cfs, instead of the proposed 250 cfs, be left in the River. This additional mitigation measure will ensure safe migration of salmonids downstream over Sunset Falls as well as ensure sufficient flows over the falls for aesthetic and recreational values. With this additional measure the Sunset Fish Passage and Energy Project is the recommended action of this EIA document. The Sunset Fish Passage and Energy Project is a viable, environmentally safe method to produce renewable energy for the people of Snohomish County and Camano Island at a favorable cost.

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